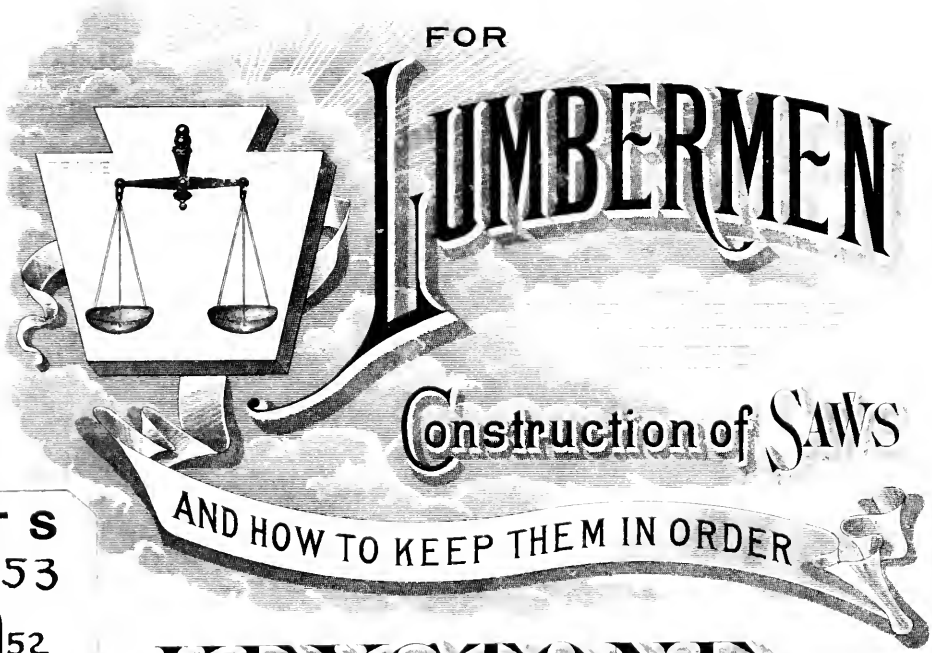
HENRY DISSTON & SONS

INCORPORATED

PHILADELPHIA, PA. U. S. A.



KEYSTONE

SAW, TOOL, STEEL AND FILE WORKS.

HENRY DISSTON & SONS

INCORPORATED

HAND BOOK
for LUMBERMEN

BRANCH HOUSES

CHICAGO — NEW ORLEANS
BOSTON — LOUISVILLE
MEMPHIS — CINCINNATI
SAN FRANCISCO

Keystone
Saw, Tool, Steel and File Works

PHILADELPHIA, PA.

List of Terms

.....USED IN.....

Manufacturing, Running and Repairing Saws.

INTRODUCTION.

Henry Disston, the founder of the establishment of Henry Disston & Sons, incorporated, began making saws in 1840. The lumber manufacturing business, at that time in its infancy, has since been brought to a high state of perfection; thousands of feet of lumber per day are demanded, where formerly hundreds were sufficient. Consequently, saws are required which will stand tremendous speeds and the strain put upon them by an enormous feed.

After repeated unsuccessful efforts to procure steel of the desired quality, this firm, in 1855, erected a crucible steel plant expressly adapted to the manufacture of saw steel. Constant efforts and unlimited expenditure of time and money enabled them to produce the steel, which, for general excellence has established an enviable and World wide reputation.

The valuable data collected as manufacturers of saws of all kinds and descriptions, together with the experience gained in making steel, has placed the firm of Henry Disston & Sons, Inc., in a position to make steel peculiarly adapted to the requirements of the various branches of saw making. The plant has been remodeled several times, once consequent upon removal, three times after destructive fires, and each time has arisen, Phœnix-like, larger and better than ever, and with the extensive additions now about completed makes it, beyond question, the largest and most modern crucible saw steel plant and saw factory in the World.

The steel being of uniform grade insures a uniform temper in the saws, which, in connection with the system of hammering, grinding and tensioning employed, makes DISSTON SAWS superior to all others. The most skillful mechanics in all branches, tempering facilities exclusively their own, a shop equipped with the finest machinery and a determination to spare no necessary expense to make perfect saws, has gained for the saws bearing the name Henry Disston & Sons, the high reputation they bear.

That this policy is a wise one is evidenced by the fact that DISSTON SAWS are used by the great majority of lumber manufacturers, wood and metal workers throughout the World. The name DISSTON on a saw is a guarantee it is the best that can be produced.

WARRANTY.

EACH SAW is warranted as true as it is possible to make it, free from flaws and seams. If found defective in any of these particulars it may be returned, and if on examination we are satisfied the saw is at fault, all necessary repairs will be made free of charge, or a new saw given in exchange, provided it is returned within thirty days from delivery.

We do not warrant saws cracked in gumming where the punches and dies are not kept in proper order. The filing of square corners in the gullets will also cause the plate to crack. Our warranty does not cover such cases.

HENRY DISSTON & SONS,
(INCORPORATED.)

IMPROVED METHOD OF CASTING STEEL INGOTS, OR COMPRESSED STEEL.

Patented.

From the time saws were first made to the present, saw manufacturers have had the greatest difficulty in obtaining steel plates for saws that were free from flaws caused by cavities formed in the ingots while cooling. These cavities are injurious to the steel and give the saw plate the appearance of being made of two pieces of steel not properly welded together and cause the teeth of that portion of the saw to split, spall or crumble.

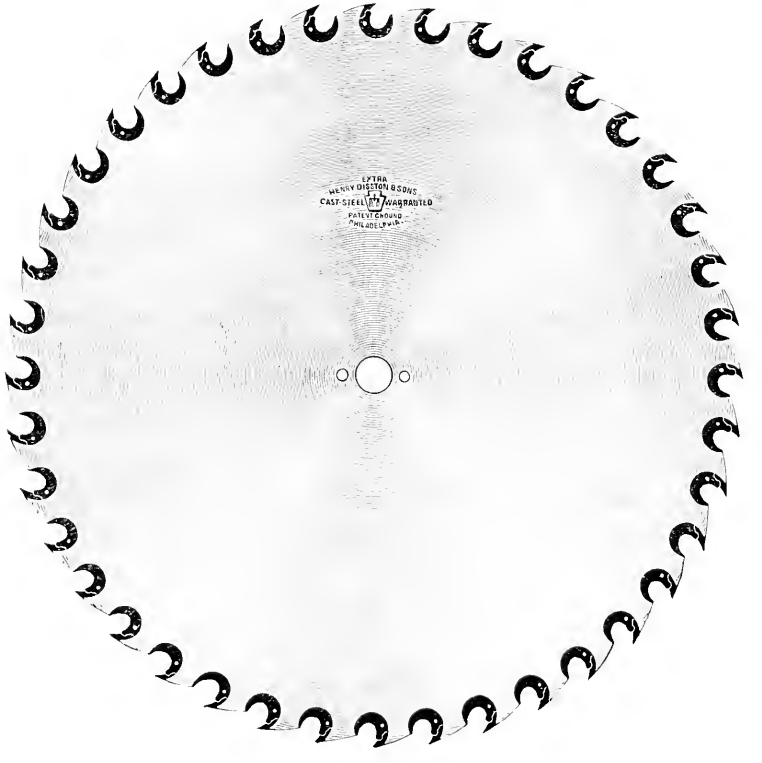
It was impossible to detect all of these flaws in the ingot or in the plate after rolling, consequently saws have been sent out by all manufacturers that have proven unsatisfactory, causing an expense to both the mill man and the maker; an expense to the mill man in loss of time, and a dead loss of the saw to the manufacturer. We have always taken the utmost care in the manufacture and inspection of our steel and saws and have always headed the list as saw manufacturers; but in spite of our best endeavors, we were, until quite recently, unable to entirely overcome this difficulty. We are glad to state that after years of careful study and expensive experimenting, our efforts have been crowned with the *greatest success of the age*. Our *method* of casting steel ingots and *process* of compressing same, entirely does away with all splitting, spalling and crumbling of teeth. This process has long been sought by prominent steel makers both in this country and Europe; several patents have been granted for compressing and improving saw steel, but all efforts in this direction failed until our patent process was brought out.

This method not only does away with the splitting and spalling of teeth, but makes a hard, tough, elastic steel of the highest quality, which with our improved and patented process of manufacturing and tempering, enables us to furnish our patrons with saws that for toughness, standing-up quality, uniformity of temper and general superiority, have never been equaled.

SUPERIOR TO ALL OTHERS.

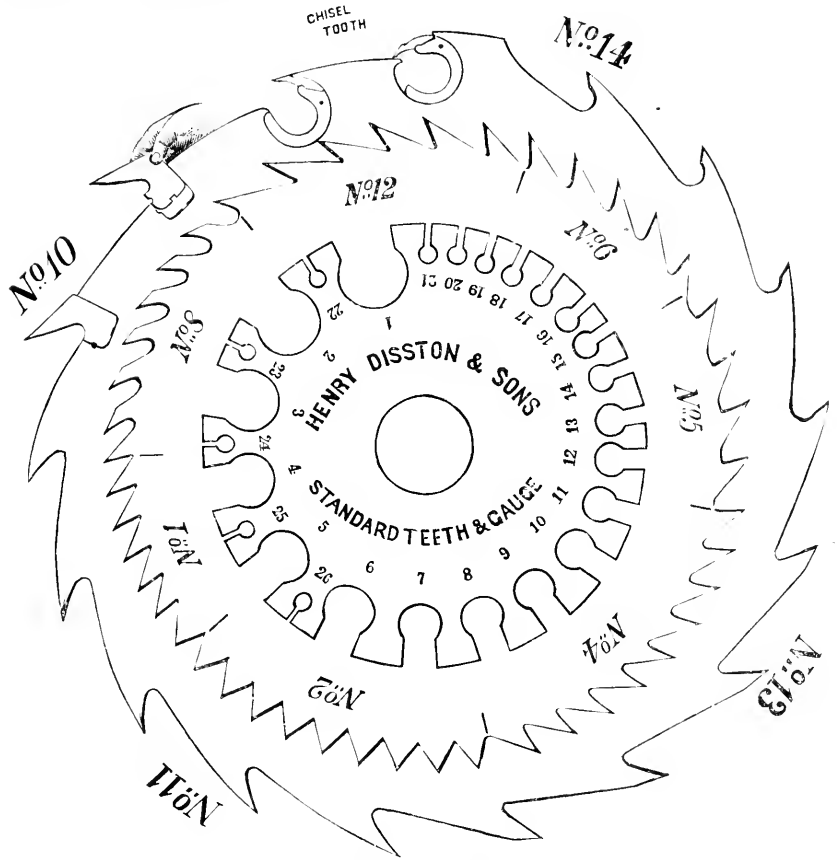
Having had over sixty-two years' experience in manufacturing saws, and from the fact that by constant experimenting, at great cost, we have achieved a state of perfection in material, machinery and methods unattained by others and only accomplished by years of watchfulness and application, we feel justified in claiming the Disston Saws are superior to all others.

Disston's Saws are used wherever lumber is made, and are the criterion by which the merits of all others are judged.



When ordering saws, time and trouble will be saved by exercising care in making out the order; we furnish blanks to facilitate this, which can be had on application.

The illustration below represents various Styles of Teeth for Circular Saws, and our Standard Gauge. By referring to this when ordering, customers will be enabled to inform us the style of tooth and gauge of saws required.

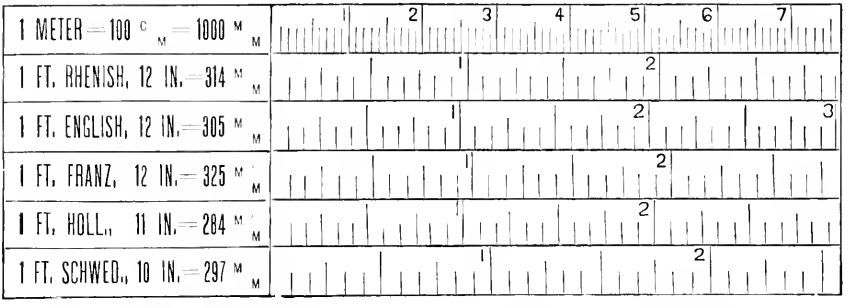


Gauge,	No.	4	. . . .	$\frac{1}{4}$	inch	scant.		
"	"	5	. . . .	$\frac{5}{32}$	"			
"	"	6	. . . .	$\frac{11}{64}$	"			
"	"	7	. . . .	$\frac{5}{16}$	"	scant.		
"	"	8	. . . .	$\frac{5}{32}$	"	full.		
"	"	9	. . . .	$\frac{5}{32}$	"	scant.		
"	"	10	. . . .	$\frac{1}{8}$	"	full.		

Gauge,	No.	11	. . . .	$\frac{1}{8}$	inch	scant.
"	"	12	. . . .	$\frac{7}{64}$	"	
"	"	13	. . . .	$\frac{7}{64}$	"	
"	"	14	. . . .	$\frac{3}{64}$	"	full.
"	"	15	. . . .	$\frac{3}{64}$	"	scant.
"	"	16	. . . .	$\frac{1}{16}$	"	full.

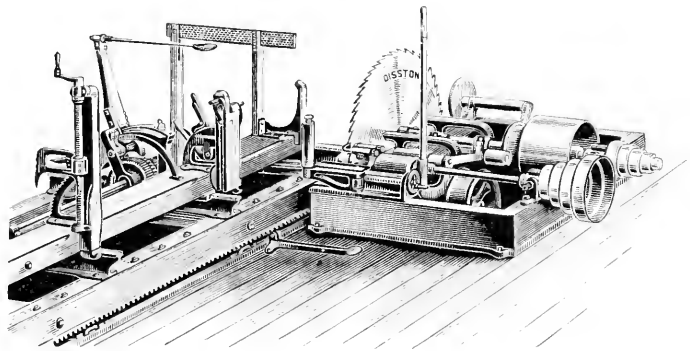
On the following page will be found the equivalent of the gauges in decimals of an inch, also the difference between the London, Birmingham or Stubbs and American gauges. The Disston gauge corresponds exactly to the Stubbs gauge.

The World's Measurements.

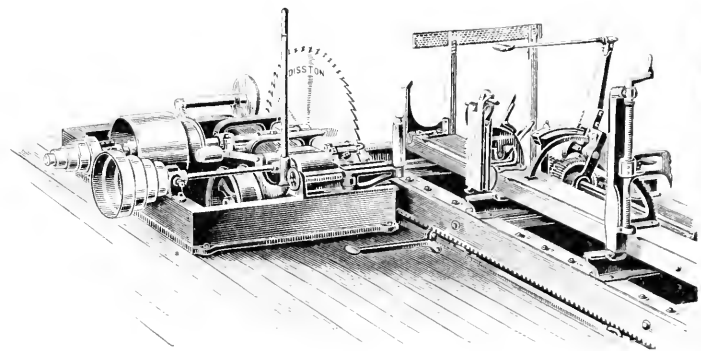


GAUGE.	LONDON.	STUBBS, BIRMINGHAM OR DISSTON.	AMERICAN OR BROWN & SHARP.
0	.340	.340	.32495
1	.300	.300	.28930
2	.284	.284	.25763
3	.259	.259	.22942
4	.238	.238	.20431
5	.220	.220	.18194
6	.203	.203	.16202
7	.180	.180	.14428
8	.165	.165	.12849
9	.148	.148	.11443
10	.134	.134	.10189
11	.120	.120	.09074
12	.109	.109	.08081
13	.095	.095	.07196
14	.083	.083	.06408
15	.072	.072	.05706
16	.065	.065	.05082
17	.058	.058	.04525
18	.049	.049	.04030
19	.040	.042	.03589
20	.035	.035	.03196
21	.0315	.032	.02846
22	.0295	.028	.025347
23	.027	.025	.022571
24	.025	.022	.0201
25	.023	.020	.0179
26	.0205	.018	.01594
27	.01875	.016	.014195
28	.0165	.014	.012641
29	.0155	.013	.011257
30	.01375	.012	.010025
31	.01225	.010	.008928
32	.01125	.009	.00795
33	.01025	.008	.00708
34	.0095	.007	.0063
35	.009	.005	.00561
36	.0075	.004	.005
37	.0065		.00445
38	.00575		.003965
39	.005		.003531
40	.0045		.003144

LEFT-HAND SAW.



RIGHT-HAND SAW.



When Ordering Circular Saws, the Following Directions Should Be Explicitly Given:

Diameter, in inches; thickness or gauge at centre; thickness or gauge at rim; right-hand or left-hand (see engraving above); number of teeth; style of tooth, as illustrated on page 11; size of mandrel-hole; size of pin-holes, distance from centre to centre of pin-holes; greatest feed at each revolution, in inches; kind of timber to be sawed; number of revolutions per minute; horse-power of engine and daily output of mill. When ordering bolting saws, state whether rip or cross-cut.

N. B.—All our stock saws, forty inches in diameter and larger, have 2-inch mandrel-hole and 5/8" tug pin-holes, three inches from centre to centre. If wanted different, please send full pattern of holes.

Hints to Sawyers and Saw-Mill Men.

A GOOD SAW.

Our saws stand at the head of the market on their merits, and although they are unequaled for quality of material, workmanship, toughness and elasticity, it is quite important that they should be adapted to the capacity of the mill and the class of timber they have to cut.

When in need of saws write us giving a full description of the mill and timber they are wanted for, and we will guarantee to furnish saws adapted to the requirements.

Below find some of the causes which give rise to complaints against saws and sawmakers.

Insufficient power to maintain regular speed.

Too thin a saw for the class of work required.

Not enough or too many teeth for the amount of feed carried.

Weak and imperfect collars.

Collars not large enough in diameter.

Ill-fitting mandrel and pin holes.

Uneven setting and filing.

Not enough set for proper clearance.

Too much pitch or hook of teeth.

Irregular and shallow gullets.

Out of round and consequently out of balance.

A sprung mandrel, or lost motion in mandrel boxes.

A carriage track neither level nor straight.

Carriage not properly aligned with saw.

Lost motion in carriage trucks.

Heating of journal next to saw.

Guide-pins too tight or not properly adjusted.

Backs of teeth too high for clearance.

Attempting to run too long without sharpening.

DULL TEETH AND SQUARE GULLETS.

A very general cause of trouble is a *dull saw*, not only dull on the extreme points, but the cutting portion of the tooth under the points, as illustrated in Fig. 1.

The points of the saw-teeth are the only parts of the saw that should come in contact with the lumber. They must be kept sharp by frequent use of the file, and set by springing, swaging, or spreading when necessary, sufficiently to clear the blade of the saw nicely to prevent friction. As the points of the teeth do all the work, they become dull and round, the sides of the points wearing away as well as the points themselves. Great care should be taken to maintain the proper shape of points. This can readily be done by the use of a Jumper or Upset (see pages 60 to 62) when necessary.

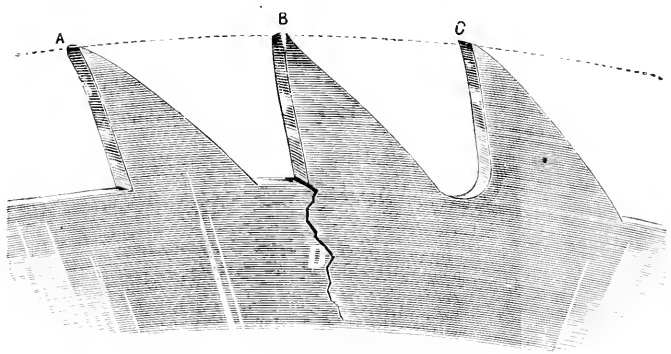


FIG. 1.

It will be observed in the cut above that in addition to having sharp corners in the gullets, teeth A and B are very dull; tooth C shows how the points and gullets should be dressed. The gullets should be kept rounded out, either with a gummer or a file.

A saw-tooth becomes dull on the side or under the point in proportion to the amount of feed; for instance, if the tooth takes one-sixteenth of an inch hold at each revolution, it will become dull to a depth of one-sixteenth of an inch below the point, or more or less as you increase or diminish the feed. A few minutes filing two or three times a day will save much of the time and labor otherwise expended in running a dull saw, and effect a saving in the power consumed, increase the output and improve the quality of lumber manufactured.

Do not file square corners in the gullets of the saw, as it is very liable to cause breakage, as shown at D in cut above, particularly when the teeth are dull or in frosty weather. Our *warranty does not cover saws broken from sharp corners filed in the gullets.*

SAWS OUT OF ROUND.

The cutting of a circular saw should be continuous, consequently the saw must be perfectly round to give the best results. No saw can reasonably be expected to give good results if it is out of round, for when a saw has long and short teeth it naturally follows that the longest teeth will do the most work, this throws the heaviest strain on that part of the saw instead of distributing it equally around the entire circumference. It is fully as important that saws be kept perfectly round as it is that they should be kept well swaged and sharpened.

It is a comparatively easy matter to keep saws round with automatic machinery, but it requires a skilful man to keep them round simply by the action of sharpening with a file. All filers should "joint" their saws frequently. In swage-set saws always joint after a fresh swaging by holding a piece of grindstone against the teeth while the saw revolves, thus reducing the teeth to a common length, then file them again to a keen cutting edge. Keep the saw round, well set and nicely sharpened.

SETTING THE CARRIAGE TRACK AND HUSK OR SAW FRAME.

It is very essential to good work that the foundation of the mill should be amply strong to withstand the shocks it is subjected to in turning logs; the track stringers should be good sound heart lumber, preferably Yellow Pine, as this is a firm wood and will resist moisture. The size of the stringers should not be less than 8″ x 8″ and as few pieces as possible to make up the necessary length. These stringers should be set perfectly level and parallel with the mill house and *gained* into the girders and joists of the mill floor or foundation timbers, and secured by keys and bolts so that they will not change position when logs are rolled against the head blocks. The track irons, particularly the *V* side, should be firmly bolted to the stringer and when finished be perfectly straight and level.

It is quite as important that the saw frame should be firmly secured to its place as that it should be level and solid, for the vibration and strain are of such a nature that the frame would quickly change position unless *very* firmly secured. The slightest change would make a vast difference in the running of the saw and necessitate relining. When putting in the husk stringers, use well seasoned wood and put them down in such a manner that they cannot possibly change their position, then find the position of the husk on the stringers and fasten down securely with through bolts.

LINING THE SAW WITH THE CARRIAGE.

The amount of lead required for circular saws should be the least amount that will keep the saw in the cut and prevent it heating at the centre. If the lead into the cut is too much, the saw will heat on the rim; if the lead out of the cut is too much, the saw will heat at centre, we therefore give the least amount that is used, which is one-eighth of an inch in twenty feet.

Of the various methods used for lining a saw with the carriage, we give what we think will be the most easily understood: First, see that the mandrel is set perfectly level, so that the saw hangs plumb and true when screwed between the collars, and is flat on the log side. Draw a line running ten feet each way from centre of mandrel and parallel with the V track, fasten a stick to the head-block, so that it comes up to the line at the end in front of saw; run the carriage forward the twenty feet, move the rear end of line one-eighth of an inch away from former parallel position, then slew the end of mandrel either forward or backward until it is exactly at right angles to the new position of line, and the saw parallel with same.

All end play must be taken out of the mandrel and carriage trucks when lining a saw to the carriage, and the track must be laid solid, level and true, so that the carriage will run straight and smooth.

COLLARS FOR SAWS.

For a perfect running saw it is indispensable to have the collars and stem of mandrel true and well fitting; any imperfection in these points is multiplied as many times as the saw is larger than the collars; they should fit exactly.

For large saws we prefer collars that have a perfect bearing of three-quarters of an inch on the outer rim, the other part clear, as they hold tighter than a solid flat collar. Examine the collars carefully to see if they are true, if not, have them made so; also be sure that stem of mandrel fits the hole nicely and offers no obstruction to the saw slipping easily up to and against the fast collar. We advocate the use of six inch collars for portable and semi-portable mills. Collars for steam feed mills should be larger.

Test the saw with a straight edge, and if it is found true place it on the mandrel, tighten up the collars with a wrench, test again with a straight edge and see if the position of the blade has been altered; observing whether it shows true, if not, the fault is sure to lay in the collars and will be likely to ruin the saw. The best results cannot be obtained from the mill until the defects are remedied.

We finish all our circular saws by a process, which insures each

side of the saw plate being perfectly true throughout its entire surface; by this invaluable process, every particle of uneveness is removed; the saw never requires packing (providing the collars are true), and all the trouble which has hitherto perplexed the sawyer in this particular is removed.

SPEED OF SAWS.

This is a very important point for consideration, as a hundred revolutions, more or less, will always make a great difference in the running of the saw. We can adjust the tension of saws to overcome a slight variation in speed provided full instructions are given when ordering, though we would advise a regular speed at all times. Our experience has been that saws work better when run at a regular speed even if it is necessary to reduce the number of revolutions one hundred below that given in table, than to have a variable speed. If the power is too light to maintain the standard speed, run the engine at a higher *regular* speed, put a larger diameter receiving pulley on the mandrel, and the results will be better both as to quality and capacity. This will be much better than the throttle plan, even if the speed does fall below that given in the table; the regularity is the most desirable point to look after. Following is a table of speeds:

SPEED OF SAWS RUNNING 10,000 FT. PER MINUTE ON THE RIM.

72 in.,	530 revolutions per min.	36 in.,	1,080 revolutions per min.
68 "	560 " "	32 "	1,225 " "
64 "	600 " "	28 "	1,400 " "
60 "	640 " "	24 "	1,630 " "
56 "	700 " "	20 "	1,960 " "
52 "	750 " "	16 "	2,450 " "
48 "	815 " "	12 "	3,260 " "
44 "	890 " "	10 "	3,920 " "
40 "	980 " "	8 "	4,600 " "

RULES FOR CALCULATING SPEED, Etc.

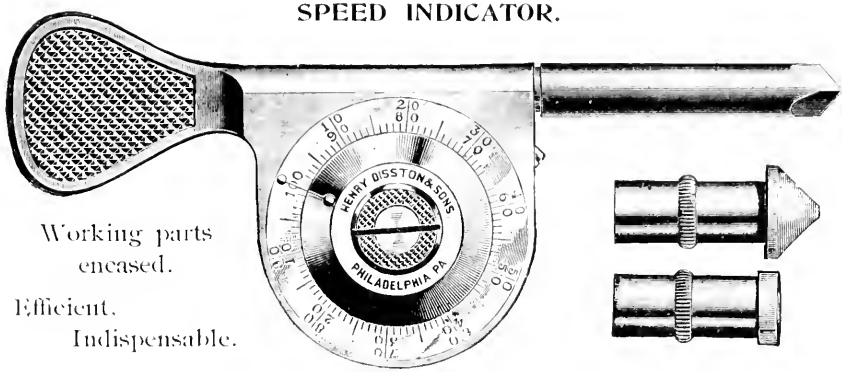
PROBLEM 1. The diameter of driving and driven pulleys and the speed of driver being given, find the speed of driven.

RULE. Multiply the diameter of driver by its number of revolutions, and divide the product by the diameter of the driven; the quotient will be the number of revolutions of driven.

PROBLEM 2. The diameter and revolutions of the driven pulley being given, find the diameter of the driver.

RULE. Multiply the revolutions of driven by its diameter and divide the product by the revolutions of the driving shaft; the quotient will be the diameter of driver.

SPEED INDICATOR.



Millmen and Sawyers should know the correct speed of all machinery and saws operated by them. It is very important that exact speeds be given with all orders for large circular saws. We guarantee the accuracy of the indicator illustrated above and advocate its use.

KEEPING AND FITTING SAWS, Etc.

See that the saw slips up freely to fast collar and hangs straight and plumb when tightened up; that the mandrel is level, in proper line with the carriage, and that it fits in its boxes as neatly as possible without heating, for when the mandrel heats, by transmission, the saw will heat also and thus expand in the centre, which will make it work badly, injure, and perhaps ruin it. We do not warrant a saw to run on a mandrel that heats, although if we knew exactly to what degree it heats we could make a saw that would admit of that much expansion, but a heating mandrel will *always* give more or less trouble. To get the best results from a mill this must be overcome. (See article on mandrels for circular saws.)

Take up all end play or lateral motion in mandrel, as the grain of the wood will draw or push the mandrel endwise, no matter how well the saw is kept. See that the carriage track is level, straight, solid and in proper line, also that rolls or trucks have no end play. Keep all gum or saw-dust off the tracks. Keep the saws sharp, round and swaged or set enough for clearance; when everything is in proper shape $\frac{3}{32}$ of an inch equally divided is sufficient swage or set. Keep extreme point of tooth the widest. Do all the filing on the under or front side of tooth, filing square across the teeth. Never file square corners in the gullets of saws of any kind, as this renders them liable to break. When there is occasion to swage or upset the teeth of the saw, file them all to a sharp point first; this will not only save time but will save the saw, for the sharper the teeth the more easily will they upset or swage.

Endeavor to keep the teeth in the shape they were when new, for if they lose any of the hook or rake or saw-dust chamber, the saw will not only consume more power but be harder to keep in order, as well as make inferior lumber. Keep the saw well balanced and the gullets well gummed out. Much better results will be obtained, and saws, time and files saved, by following the instructions given with our Gummers.

SHARPENING AND GUMMING WITH EMERY WHEELS.

In sharpening or gumming saws with emery wheels always use a good, free-cutting wheel, and never put so much pressure on it or crowd it so fast that the teeth are heated to such an extent they become blue, for when teeth are blued, glazed, or case-hardened by the emery wheel, they are apt to break or crumble when in the cut or the next time they are swaged. Joint the emery wheel occasionally to retain the shape of its face and to remove glaze.

When gumming, it is best to gum around the saw several times instead of finishing each tooth at one operation, for by going over the teeth several times, they are less liable to case-harden or blue, and a more uniform gullet is obtained. After gumming, it is advisable to file all around the saw, taking care to remove the fash or burr left on the edges and all the glazed or hard spots. Gumming and sharpening with the emery wheel will cause the saw to "let down" or lose its tension much quicker than by the use of the file or burr-gummer, as it heats and expands the rim of saw, putting it in the shape generally termed by mill-men "buckled," which makes it appear loose and limber and causes it to run snakey in the cut. Many saws are condemned just from this cause and thrown aside as worn out, when by proper work and hammering they can be made as good as new saws of the same size.

In sending us old saws for repairs, mark plainly on the case whom they are from, and write us full instructions as to the work to be done, and we will guarantee to put as good and durable tension in them as they had originally.

We carry a stock of emery wheels for the requirements of mill men at regular market prices.

THIN AND EXTRA THIN LARGE SAWS.

As we have said in the preceding pages, all saws and saw-mill machinery must be kept in the proper shape to obtain the best results; this is especially necessary in running thin saws, for while a thick or standard gauge saw will give very fair results where only medium skill in the management of saw and mill is used, a thin saw would fall far

short of giving fair results under the same methods and management. A thin saw cannot reasonably be expected to stand as much crowding as a thick one and requires more skill and better appliances to give good results.

It is always necessary to have enough set in a saw to give sufficient clearance, which means enough to prevent the log from rubbing on the body of saw.

In the usual gauges of large circular saws, say 7, 8 and 9, used in the ordinary manner on the average feed and lumber, $\frac{3}{32}$ of an inch equally divided is about as little clearance as should be run except in hard woods and frozen timber, then less may be used. A thin saw requires just as much clearance as any other saw, consequently, in proportion to thickness, the thin saw has the most strain to bear. For this reason alone the best skill and mill are required to successfully run a thin saw. We do not wish to convey the idea that we do not make thin saws, but simply desire our customers who contemplate putting them in to appreciate the differences in working between thick and thin saws. The difference in thickness between 8 gauge and 10 gauge is $\frac{1}{32}$ of an inch; the set for clearance of each being the same, $\frac{1}{32}$ is all it is possible to save in kerf, and between an 8 gauge and 11 gauge the difference is $\frac{1}{16}$ of an inch full, hence the saving in the instances above is very small—so small, in fact, that in nine cases out of ten it is offset by reduction in capacity or in poorly manufactured lumber.

As to saving in power, the difference in nineteen cases out of twenty is not in favor of the thinner saw, for, being so much lighter, it will deviate from its line much easier, and any deviation, ever so slight in the length of the cut, will consume by friction all the power saved in difference of kerf.

These are plain facts that any man who knows the gauges can figure out for himself, and we advise every mill man to study the subject well before ordering extra thin saws. If the mill, skill of employees and value of timber is such as to justify extra thin saws, then have them by all means, and we claim that our saws, in workmanship, toughness, elasticity, and standing-up quality of steel, are unequaled, whether thick, thin, or extra thin.

In ordering, please note that thin saws require more teeth than heavier ones to do the same class of sawing, as this equalizes the strain on the rim as well as prevents springing of the teeth.

Regularity of speed is desirable with all saws, but particularly so with thin ones, as they depend more than the others upon the velocity to hold them up to their work. In extra thin saws, one-sixth more speed than given in the table will be advantageous.

CHISEL POINT SAWS.

Chisel Point Saws are made in several sizes. Those most used are the No. 1 and No. 2 Oregon, No. 3, No. 4, and No. 4½ Chisel Point. The illustrations on pages 27 to 29 show these sizes and their adaptability to the various kinds of work.

Our Chisel Point Saws are constructed on scientific principles and embody all the latest improvements in the line of Inserted Tooth Saws.

To insure perfection in their manufacture, special machinery particularly adapted to the insertion of the teeth is employed The holders and points are grooved on the same lines, and are guaranteed to fit. The points and holders are exact duplicates and may readily be replaced. If they are ordered according to directions they will suit any saw made for that size of holder and point.

When ordering Chisel Point Saws, the directions on page 13 of this Hand Book should be followed. If the number of teeth is to be left to our judgment, specify the horse power available to drive the saw, the speed at which it will be operated, the greatest feed in inches per revolution, the kind of timber to be sawed, and the daily capacity of the mill.

HOLDERS.

In sawing sandy or gritty logs, the edges of the inner circles of the holders are liable to wear and become rounded. This permits a portion of the dust to pass down between the side of the saw and the log, instead of being properly chambered and carried out of the cut. The tendency then is to create friction and heat, which is detrimental to the good working of the saw. To prevent this the edges of the inner circles of the holders should be filed across and kept square. Holders which have become thin from long usage should be discarded and replaced with new ones.

The swaged pattern of holder, which is one-and-one-half gauges heavier in the throat than the sawplate proper, will be supplied if specified in order.

SPECIAL HOLDERS.

When the sockets holding the shanks are worn large, it is advisable to order the special sizes of shanks designed to take up this wear. There are two special sizes; one is $\frac{1}{64}$″ and the other $\frac{1}{32}$″ larger in the circle than regular.

Unless shanks fit snugly, they are liable to break or cause the points to break. A shank that has become strained or compressed through accident can be expanded by removing it from the saw, laying it on an anvil, and striking it sharply on the inner circle; consequently

there is no reason for the shanks or bits ever fitting loosely. See that the guides are set, so that they are below the sockets, for if they come in contact with the holders they are liable to turn out the teeth.

INSERTING NEW POINTS.

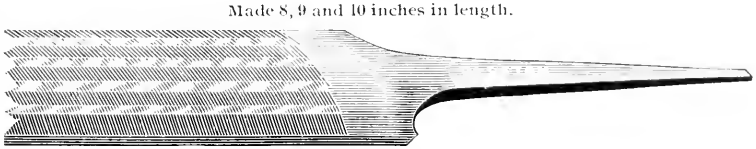
Oil the grooves carefully. Place the new point squarely on the head of the shank. If the point should not turn into position readily, lift the wrench enough to permit the ball or head of the holder to assume its proper place in the point; then start again and the point will be found to move steadily into position. Do not use undue force, the stops should meet lightly, and no additional pressure should be applied to the wrench when the heel of the bit has reached the shoulder.

SHARPENING CHISEL POINTS.

The points should be sharpened or filed without taking them out of the saw, thereby preventing unnecessary wear. The temper of these points is such that they may be sharpened by the use of a good file. The following illustration shows the File specially designed for this purpose.

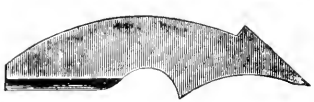
CHISEL POINT FILE.

Made 8, 9 and 10 inches in length.

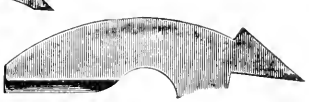


Most of the filing should be done on the front or the throat of the tooth. It is only necessary to file enough on the back to remove the burr. Very little work is required to sharpen points. Care should be exercised to keep the cutting edge at right angles to the side of the saw. Do not use a square cornered file, as this will leave a sharp nick under the point. A bit left in this condition is liable to break and injure the blade.

No. 1.



No. 2.



No. 3.

No. 1 shows the point when new. No. 2 shows the point when it has been properly filed until worn out. No. 3 shows the point improperly filed. This method weakens the bit.

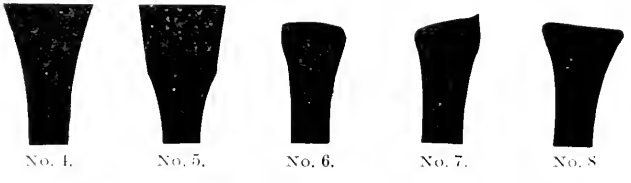
Should a bit be broken by accident, the new one must be dressed to the length and width of those in the saw.

SWAGING POINTS.

If the bits are to be swaged, the work should be done with a light hammer, drawing out the corners just enough to square the points; then the set should be dressed by a side file. Relieve the corners so as to give proper clearance. Be careful in swaging, not to strike hard enough to upset the shoulder or strain the shank, for the saw is liable to be ruined in this manner.

A section of saw containing one tooth, for use in a vise when swaging points, will be supplied at a small cost.

Particular attention is called to the necessity for keeping the cutting edges of the points widest. It is desired that this important item may not be lost sight of, since most complaints may be traced to a disregard of this requirement. If the points are filed so that they are wider behind the cutting edges than on the extreme corners, good work cannot be accomplished. The following diagrams, No. 6, No. 7, and No. 8, were taken from bits removed from saws, concerning which complaint was made. The reason is at once apparent. Diagrams No. 4 and No. 5 show two styles of side dressing, either of which is good, depending on the class of work in hand. The spread or swage should be distributed evenly on both sides of the saw.



No. 4. No. 5. No. 6. No. 7. No. 8

Chisel points are made in various widths of cutting edge A small booklet, containing a list of these sizes, will be supplied on application. The regular width is furnished, unless directions are given to the contrary. The Booklet mentioned gives full instructions on this particular.

FROZEN TIMBER.

Before starting to cut frozen timber, equip the saw with a new set of swaged holders, laying the old ones aside for summer sawing. This expenditure will be found a paying investment. The swaged holder is heavier in the throat than the sawplate proper, and is designed to hold and carry out of the cut the fine dust, which would, otherwise, pass down the side of the saw, freeze to the log, and force the saw out of line.

For winter work it is not desirable to use a side file, which will leave flat places on the sides of the points, parallel to the sides of the saw. Should you do so, be careful to see that the bits are relieved behind the points to the extreme edge. To do successful work in this class of sawing, the corners *must be sharp.*

It is possible to use narrower bits than in Summer sawing. In some sizes a special short bit, particularly designed for Winter work, is made. This short bit is illustrated and described in the pamphlet "Chisel Points and Holders."

A number of our customers operate chisel point saws very successfully in Winter by using worn points; they should be selected in sets of even length so that the saw will be round.

The old points may be swaged a trifle. Use no more set than is absolutely necessary. Taper the set back nicely from the points by careful side dressing, have the teeth widest at the extreme points, and do not allow the corners to become round, or the saw will dodge out of the cut, particularly in slabbing. The corners next to the log do most of the cutting, and soon become dull in frozen timber.

DIRECTIONS FOR ORDERING CHISEL POINTS AND HOLDERS.

Every Chisel Point Saw of our manufacture has a *shop number*, which will be found directly under our brand, midway between the eye and the rim. Invariably give this number when ordering points and holders.

When there is the slightest doubt about sizes, gauges, etc., or where the shop number cannot be obtained, send a sample point or holder (an old one will answer) with the order.

If points of a special width of cutting edge are required, it should be specified. Unless otherwise directed the regular width will be sent.

The gauge of both points and holders should be the same as the sawplate (except in special cases), and this may be determined by applying a Disston Standard Wire Gauge, which corresponds exactly to the Stubbs or English Wire Gauge.

To fill an order properly, we require to know the size of the tooth, the gauge and the width at cutting edge.

The size of holders or shanks always corresponds with the size of bits used. For example, where No. 3-8 G $\frac{5}{16}''$ points are used, the proper size of shanks to order is No. 3-8 gauge.

When ordering a Chisel Point Saw it is necessary to give the exact size of the centre hole. If the centre hole is altered after the saw leaves our hands it is liable to throw the saw out of round.

IMPORTANT NOTICE.

When returning Chisel Point Saws for repairs, please leave all the holders and points in place, for they are needed in adjusting the tension. Unless holders and points are returned we shall supply a new set at regular prices.

INSERTED TOOTH SAWS—AMERICAN SAW CO.'S DESIGNS.

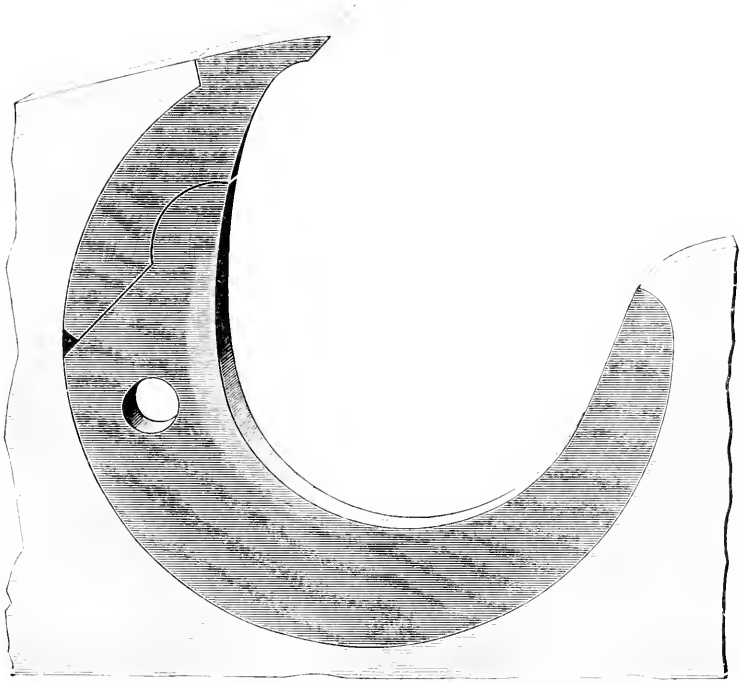
We have recently acquired, through purchase, the saw business of the American Saw Company, and are now manufacturing and supplying all of the styles of Inserted Tooth Saws formerly made by this firm, and the teeth, bits, springs, or holders, for same. We are prepared to supply the American Tooth, the Trenton Tooth regular, the Trenton Tooth (1894 style), the Brooke Bit and Spring, the Dunbar Tooth, the Risdon Tooth, the High Speed Tooth, the Prosser Tooth, and the Goulding Bit. The following illustrations will show several of these styles, all of which, with the exception of the Goulding Bit, are fastened with a rivet. These teeth are sharpened and dressed the same as a Solid Tooth Saw, and the directions in this Hand Book for the dressing of Solid Tooth Saws will apply. The teeth are all ribbed on the back to lessen the amount of swaging necessary.

When sharpening, the same cutting angles should be preserved; the gullets should be kept round, either with a round file or by the use of a proper gummer.

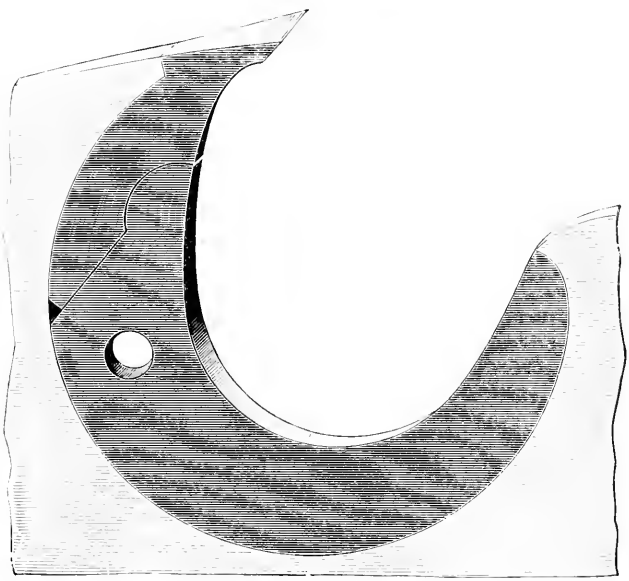
When changing teeth, first drive them into position by placing a swage on the cutting edge and striking a blow with a light hammer. Care should be exercised not to expand the rim of the saw by riveting too tightly, for if this operation is not properly done the tension of the saw will be destroyed. It is only necessary to rivet enough to secure the tooth firmly. The surplus metal may then be chipped off with a cold chisel in order that it may not interfere with the running of the saw.

For those who prefer this form of Inserted Tooth Saw to the Chisel Point, the Trenton Tooth (1894 style) is recommended.

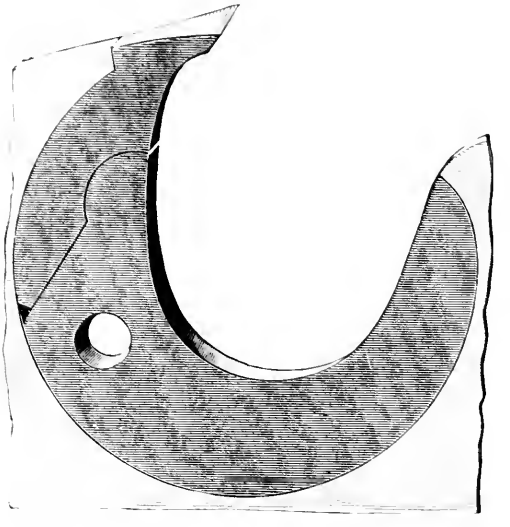
No. 1 OREGON TOOTH. Full size of tooth.



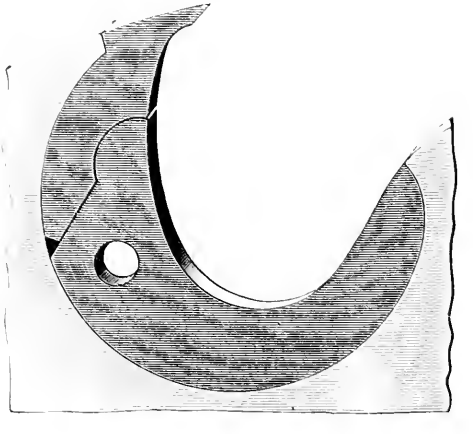
No. 2 OREGON TOOTH. Full size of tooth.



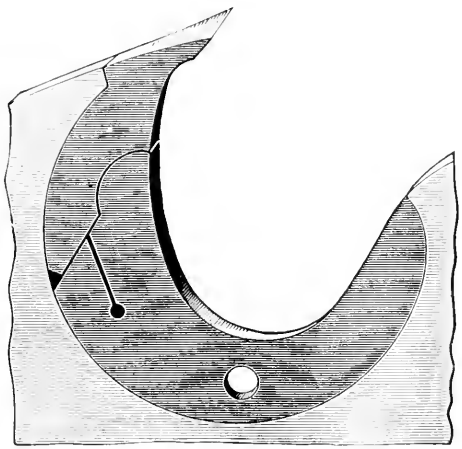
No. 3 CHISEL POINT. Full size of tooth.



No. 4 CHISEL POINT. Full size of tooth.

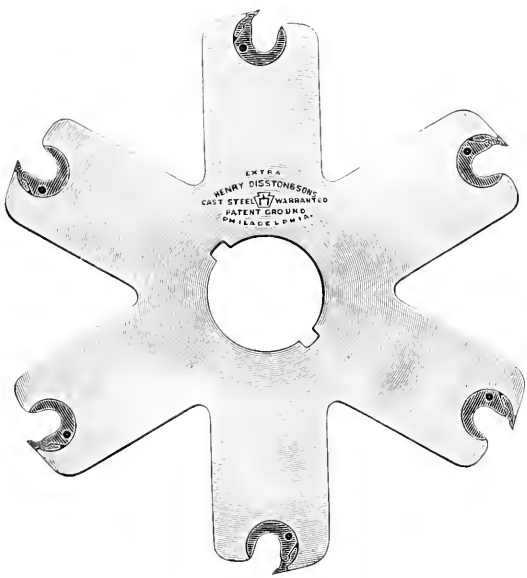


No. 4½ CHISEL POINT. Full size of tooth.

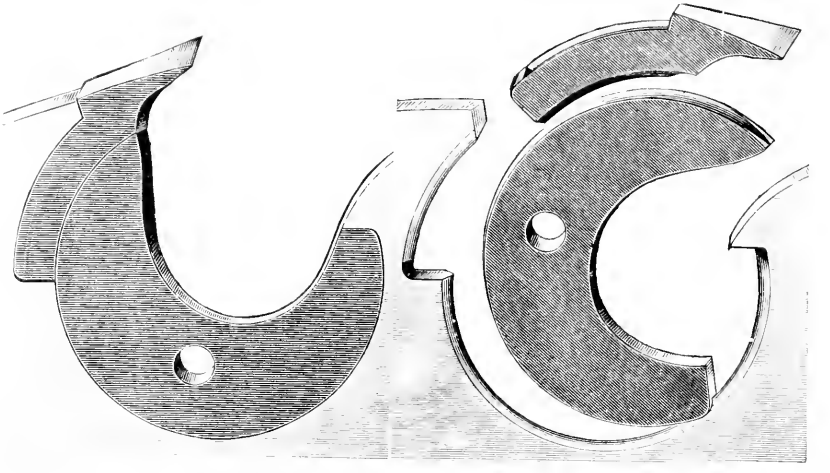


RIFT SAWS.

WITH INSERTED TEETH.

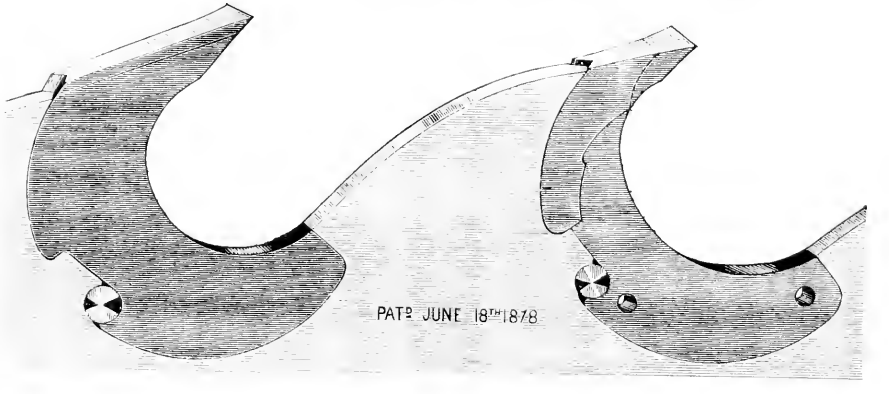


"THE GOULDING" BIT.

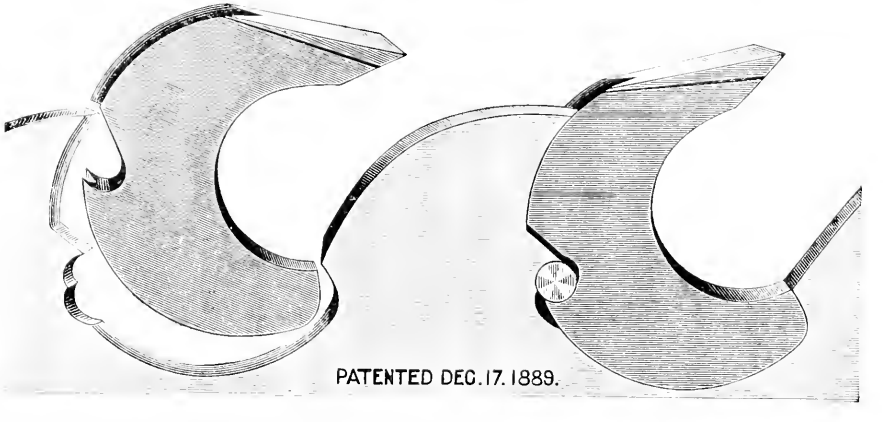


"TRENTON" TOOTH, Regular.

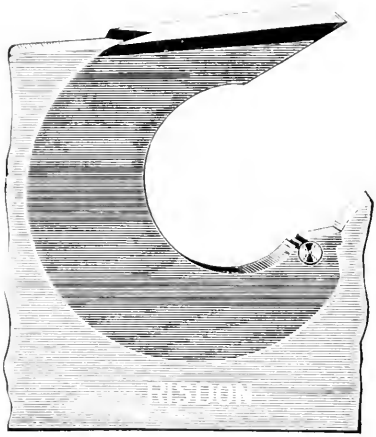
"BROOKE" BIT.



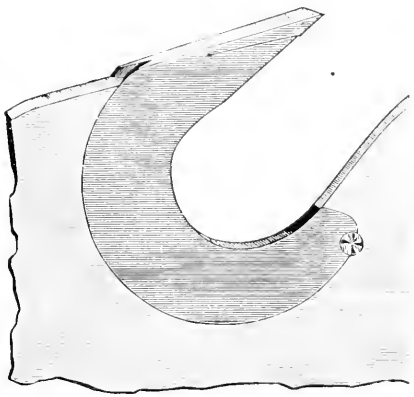
"TRENTON 1894."



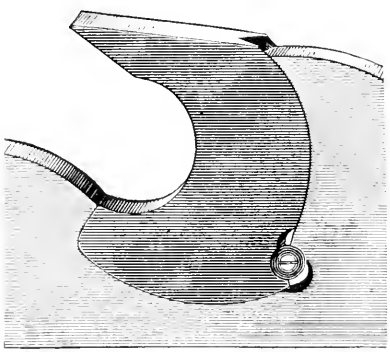
"RISDON" TOOTH.



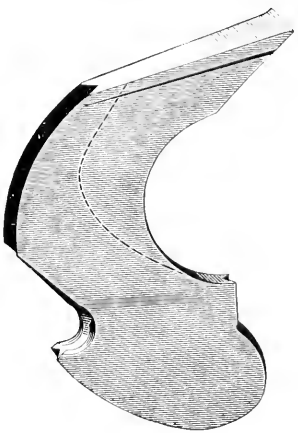
THE "PROSSER" TOOTH.



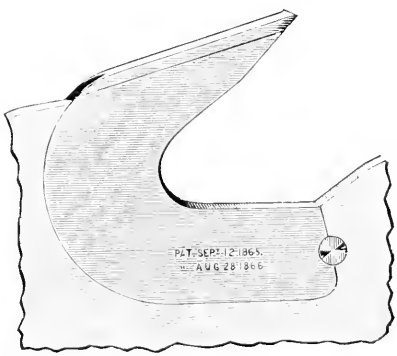
"DUNBAR" TOOTH.



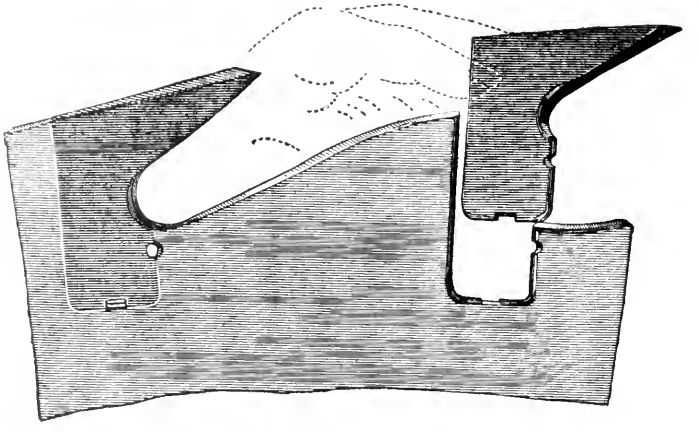
"HIGH-SPEED."



AMERICAN TOOTH.



No. 10 TOOTH.



We call particular attention to the flanged tooth, by the use of which there is a great saving in power and prevention against the heating and springing of saws.

The gullets of the teeth and that portion of the saw plate forming a part of the gullet, being swaged or flanged, all of the sawdust is carried out of the cut by the motion of the saw. This is an advantage that will readily be appreciated by mill men, for it is quite obvious the friction on the sides of the saw and tendency to heat will be materially reduced by preventing the saw dust from wedging between the sides of the saw and the cut.

The No. 10 Tooth is made in three sizes suitable for small, medium and large timber.

INSERTED TOOTH RE-SAWS.

The difficulty occasioned by wearing down or reduction in diameter of veneer, segment, heading and re-saws, has created a more general demand for an inserted tooth saw of this class, and to supply this want, we are now making quite a large proportion of our segment, heading, and re-saws with the improved re-saw inserted tooth, of which the following cut is a representation. The advantages claimed for this style of saw are numerous, the most important of which is that the original diameter of the saw is retained. This point will readily be seen by all practical operators and sawyers; for the saw must be the proper diameter and thickness at rim and centre to give the best results; if the diameter is decreased, the periphery or cutting edge is brought closer to the heavy centre or flange of saw, not only cutting out a heavier kerf, but bringing an undue strain upon both saw and

machine and causing the pieces being sawed to take a short, sharp spring-off, and in sawing short stuff where flanged saws are used, the flange or collar, by its close proximity to cutting edge of saw, splits a portion of piece from the bolt instead of sawing it, giving very unsatisfactory results both as to quality and quantity of work done. Therefore, if the saw is right at the start, by retaining original thickness and size, these difficulties are entirely obviated, and to do this, inserted tooth saws must be used, or the solid tooth must be frequently replaced.

This saw can be made in gauges from 14 to 17 at the rim, and by

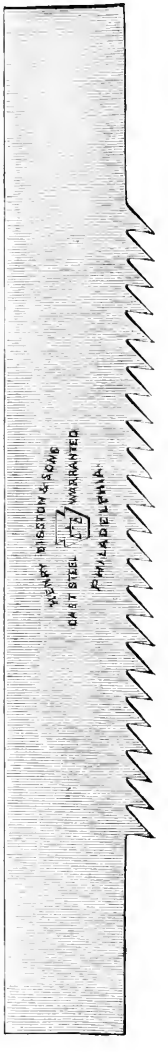
replacing the teeth when they are worn out the saw is practically renewed at a very trifling expense.

These saws are no experiment, they have been used for years with satisfactory and economical results, and we give the same warranty with them that we give on all goods bearing our brand.

We have made such improvements in our manufacturing facilities and brought this tooth to such a state of perfection that, all things considered, they are the best, as well as the most economical saws used in the class of work for which they are intended.

DISSTON

GANG



SAWS

Our Gang Saws are made from steel that is peculiarly adapted to the strains to which all gang saws are subjected in use, and for quality of material, temper, elasticity, tension and edge-holding qualities, we guarantee they have no equal.

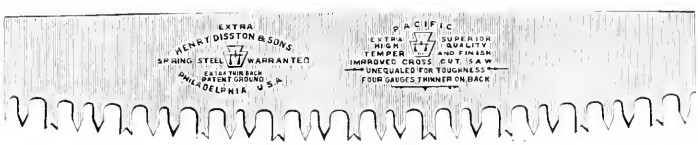
CROSS-CUT SAWS.

Illustrations of Different Patterns of Teeth.

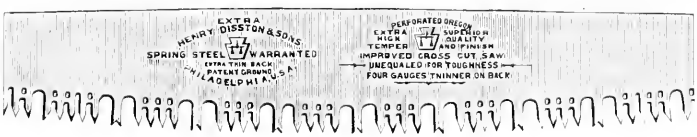
INTERNATIONAL.

NEVADA.

PACIFIC.

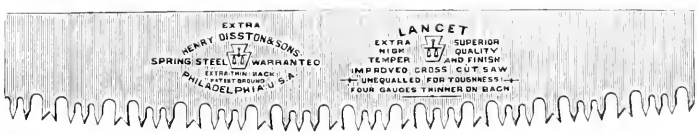


PERFORATED OREGON.



OREGON.

LANCET.



THE ABOVE STYLES MADE ESPECIALLY FOR PACIFIC COAST.

Illustrations of Different Patterns of Cross-Cut Saw Teeth.

CHAMPION.

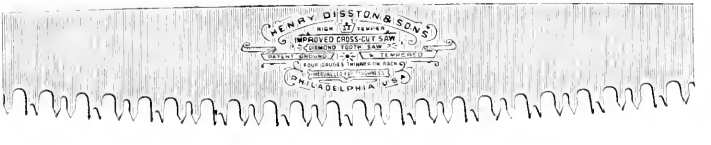
PERFORATED CHAMPION.

No. 1 GREAT AMERICAN.

LUMBERMEN.

ELECTRIC.

DIAMOND.

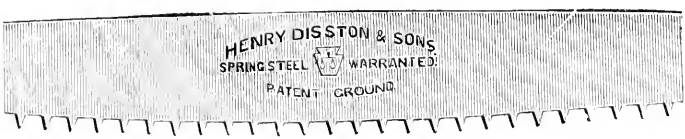


Illustrations of Different Patterns of Cross-Cut Saw Teeth.

PERFORATED LANCE.

FLEAM.

PLAIN.



TENON.

TUTTLE.

The above patterns represent a general line of cross-cut saw teeth. We make various other styles and shapes, however, as shown in succeeding pages and in our catalogue.

ONE-MAN CROSS-CUT SAW WITH SUPPLEMENTARY HANDLE.

Patented.

This engraving represents a cross-cut saw, especially adapted to the use of one man. The "Great American" one-man cross-cut saws are made and ground on the same principle as our No. 7 hand saws. We have improved the file for keeping this tooth in order, and it should be ordered with the saw.

Bridge-builders, mill men, railroad and other contractors—in fact, all large establishments—will find this a very useful tool, and easily worked. For cutting off girders, joists, blocking, or heavy lumber of any kind, it is just what is required. This saw will pay for itself in a few days, as the labor of one man is saved. The above engraving illustrates the "Great American" tooth.

TRIUMPH CROSS-CUT SAWS, Without Handles.

These saws have been made by us for many years. Being narrow, they are not liable to bind by kerf closing and are particularly adapted for cutting down trees and sawing off springy timber.

THE GREAT AMERICAN.

Patented.

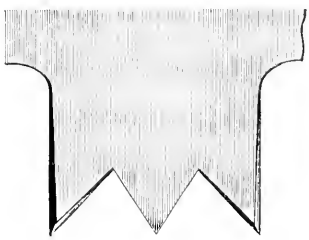
This saw has been subjected to the most severe tests, and is one of the BEST CROSS-CUT SAWS ever offered to the public. Its most important advantages are as follows:

The outer teeth of each section being straight, or at right angles to the pull of the saw, causes them to take a deeper hold in the fibre of the wood, while the middle or regulating tooth determines the extent of the cut in proportion to the bevel of said tooth. The more the centre tooth is beveled the faster the saw cuts; whereas, if the centre tooth is filed square the saw takes less hold on the log, and requires less muscle to drive it. Thus the saw can be regulated to suit the strength of the persons working it.

With this saw there is no "*tearing of the wood, undue friction or drag,*" which in many other cross-cut saws demand so much muscular exertion without a commensurate result.

There is no cross-cut saw in the market by which so much work can be done in ten hours, with so little exertion, as with the "*Great American Regulating Cross-Cut.*"

Section of Great American Tooth, Full Size.



THE LUMBERMEN

is greatly preferred in some sections of the country, and can be easily kept in order if filed according to directions, while so many of the fast-cutting saws of the present day lose their shape.

In filing this saw, the round-edge mill-file should be used, and by pressing a little downward as well as sidewise the tooth is kept in the same shape it leaves the factory.

IMPROVED GROUND CROSS-CUT SAWS, MADE FROM OUR NEW PROCESS STEEL.

These saws are made of the finest crucible saw steel. They are ground by our exclusive process, which insures an even thickness throughout the entire toothed edge and five gauges thinner on the back than on the teeth.

Sharpening cross-cut saws reduces them in width more rapidly at the centre than at ends. Our process of grinding is such that the saws retain their relative thickness of toothed edges as they wear narrow. This valuable feature will at once commend itself to every user of cross-cut saws.

For Material, Workmanship, Temper, Cutting-edge and Set-holding qualities

The DISSTON SAWS are UNEQUALLED.

Every saw is fitted ready for use, papered and stripped for separate shipment.

HUMBOLDT.

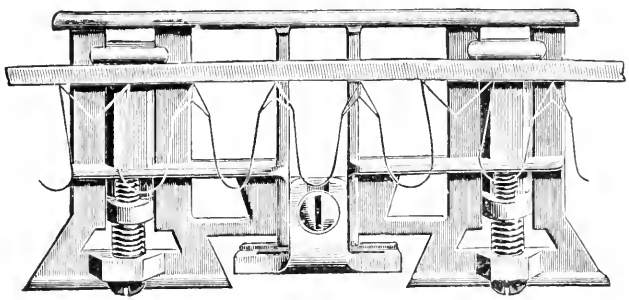
CALIFORNIA.

TOLEDO BLADE.

Disston's Universal Cross-Cut Saw Tools.

Including a Jointer, Side Dress, Cleaner Tooth Gauge, Setting Block and Set Gauge.

FIG. 1. JOINTER.



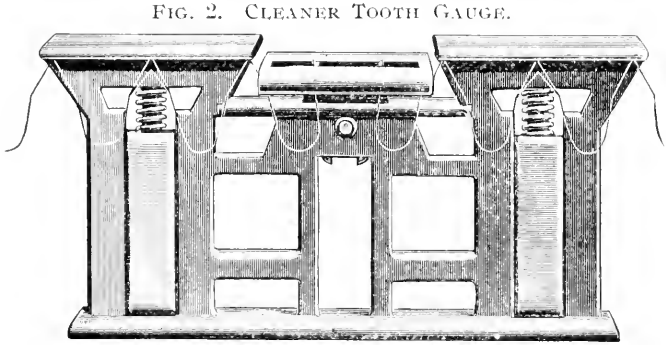
Directions for Using the Universal Cross-Cut Saw Tool.

To properly fit up a Cross-cut saw, it is necessary ;

FIRST. That the teeth be uniform in length. To accomplish this place an eight-inch mill file edgewise in the frame and secure it by screws at each end. Pass the tool lightly over the teeth until touching the shortest cutting tooth. See Fig. 1.

SECOND. Place the gauge over the cleaning teeth as shown in Fig. 2 and file them down to the required length. Care should be taken to have the cleaning teeth or rakers shorter than the cutting teeth. If the rakers are too long they will not allow the cutting teeth to come in proper contact with the work.

FIG. 2. CLEANER TOOTH GAUGE.



THIRD. Proceed with the filing, bringing each cutting tooth to a keen edge, using care not to file below the marks left by the jointing. The amount of bevel to the teeth should be determined by the class of timber to be cut ; hardwood requiring less bevel than soft wood.

Directions for Using Universal Cross-Cut Saw Tool.

FIG. 3. SETTING BLOCK.

FOURTH. If a saw requires setting, lay the block, Fig. 3, in some convenient flat place and hold the tooth of saw so that the point projects over the beveled surface fully one-quarter of an inch. Give two or three strokes with a light hammer, striking the tooth always about one-quarter of an inch from the point. Regulate the set by the use of set gauge Fig. 4. Use the side dress, Fig. 5, to remove any slight irregularity that might remain from the process of setting and to remove the feather edge left in filing by passing lightly along both sides, taking care not to disturb the sharp cutting points of the teeth. Notice always how the saw is filed when new and endeavor to keep it as near that shape as possible.

FIG. 4. SET GAUGE.

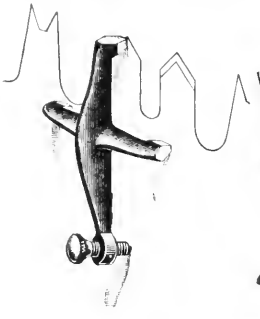
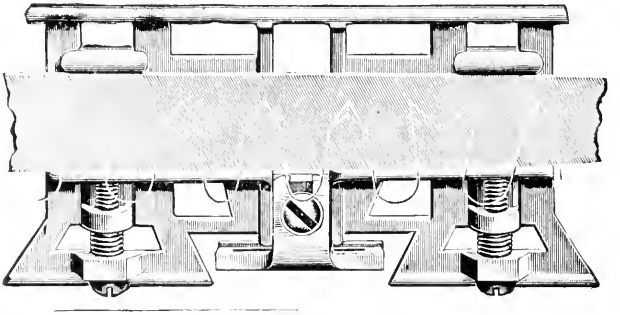
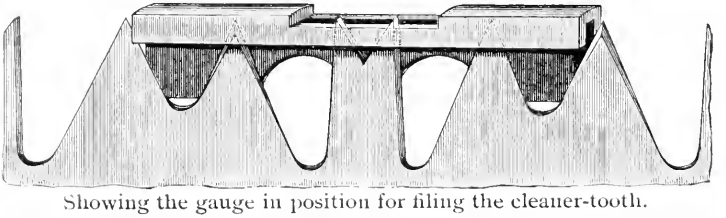


FIG. 5. SIDE DRESSER.



Gauge for Regulating Cleaning Teeth.

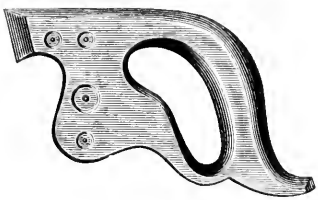


Showing the gauge in position for filing the cleaner-tooth.

The cleaning teeth of all saws should be somewhat shorter than the cutting teeth, and although shortened, should be of uniform length throughout.

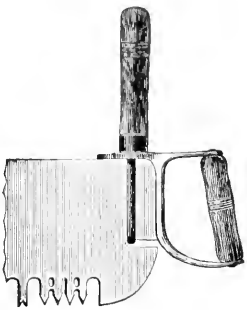
The inner edge of the gauge rests on the points of the cutting teeth, the cleaner tooth projecting through the opening in the centre of gauge. File the projecting point until arrested by the edge of the gauge, which is made of hardened steel. Thus tooth after tooth can be rapidly and correctly reduced to an even length by any unskilled operator.

PATENT CROSS-CUT HANDLES.

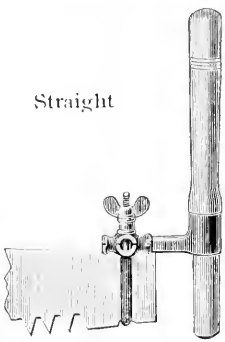


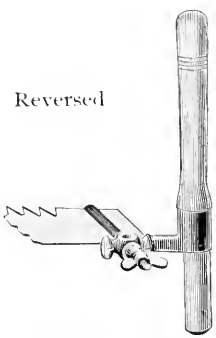
ONE MAN.

SUPPLEMENTARY ONE MAN.



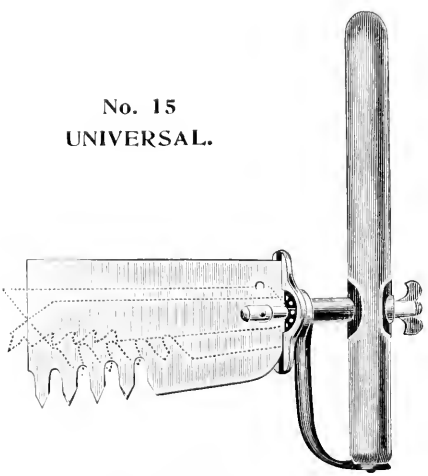
IDEAL ONE MAN.





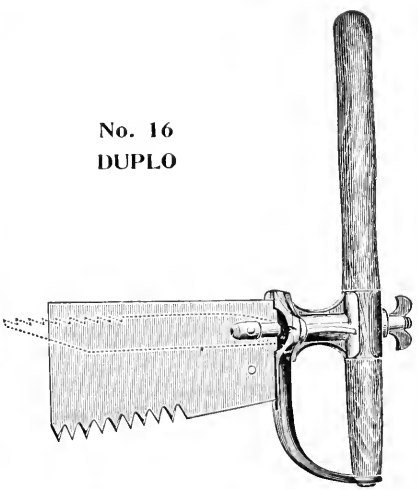
No. 7 REVERSIBLE HANDLES.

No. 15
UNIVERSAL.



A complete and perfect handle, so constructed that it may be used at any angle with a guard for protection of the hand.

No. 16
DUPLO



A double grip handle with guard for the hand.

PATENT CROSS-CUT HANDLES.

No. 4 PLAIN

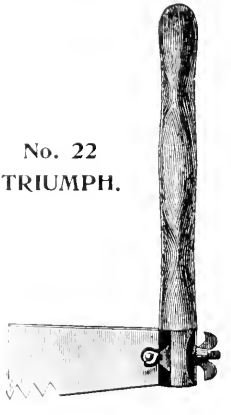
No. 3

No. 3 LOOP HANDLE.

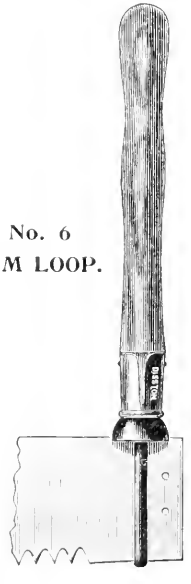
No. 13 EXTRA HEAVY LOOP.

The loose cone shape washer has been dropped in cut to show the manner in which it is fitted to the handle.

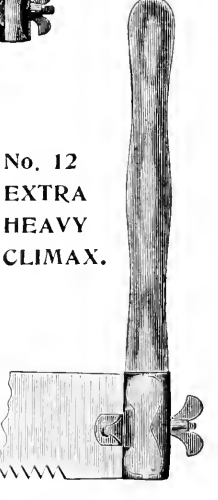
No. 13



No. 22
TRIUMPH.



No. 6
VIM LOOP.



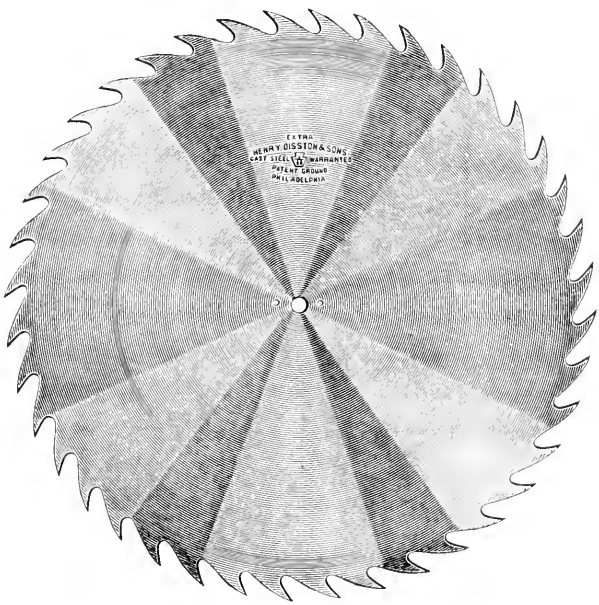
No. 12
EXTRA
HEAVY
CLIMAX.

No. 2
CLIMAX

INSTRUCTIONS

FOR

Setting and Sharpening



Hammering and Adjusting

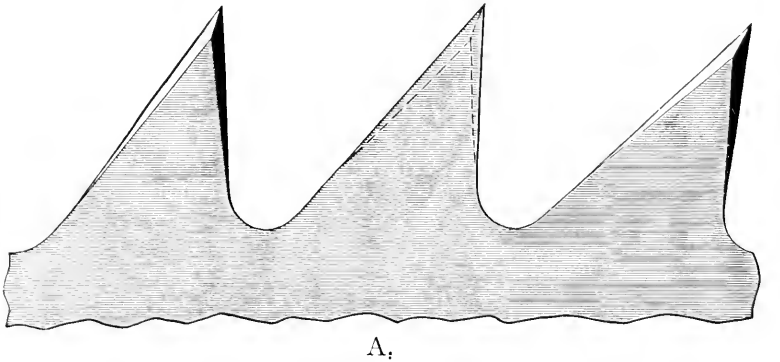
THE TENSION OF

Circular and Other Saws.

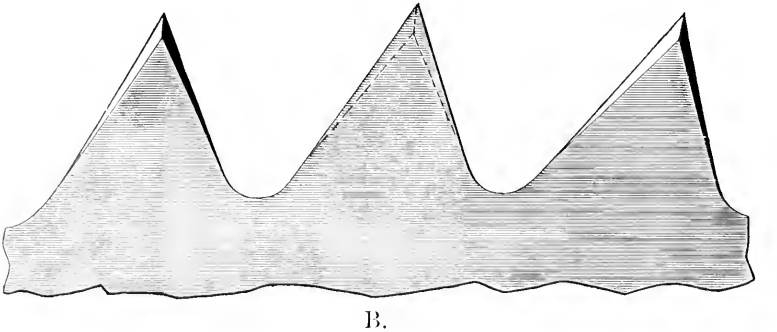
HINTS FOR COLD WEATHER.

As many saws are broken in winter, owing to the great risk in sawing frozen timber, the greatest care should be taken to prevent any undue strain. Keep the points out full, square and sharp, or the saw will dodge out of the cut, particularly in slabbing, as the corners on the log side do the most cutting and soon get dull in sawing knotty frozen timber. Use no more set than is absolutely necessary; have the teeth widest at the extreme points, but do not have them weak; taper the set nicely from point to back. Sharp corners should never be filed in the gullets as cracks are sure to start from such misuse of the saw, particularly in cold weather.

CUT-OFF SAWS.



A.

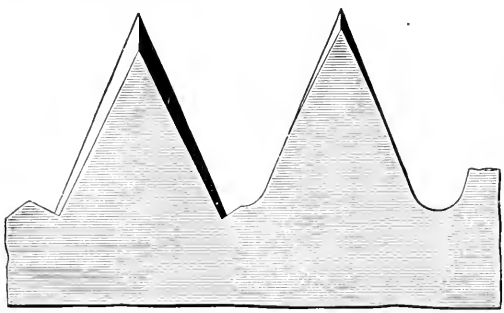


B.

Cut A shows proper shape of tooth for cross-cutting soft wood. Cut B shows tooth best adapted to cutting hard wood.

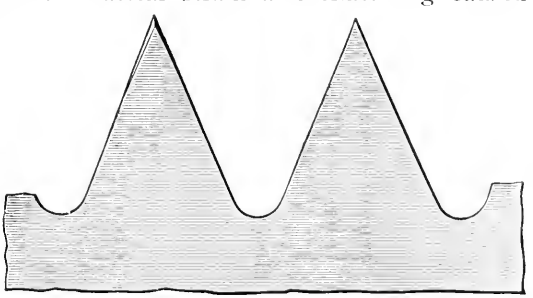
The great loss in the breaking of cross-cut or circular cut-off saws to the mill man and manufacturer of saws, induces us to call particular attention to the general neglect in the keeping of these saws in order for the work they have to perform, for there is not the same care given to a cut-off as there is to the larger saws for ripping lumber.

Nearly every case of broken cut-off saws that has come under our notice, has been caused by the careless manner in which they have been filed or gummed; if the time, labor and files consumed in filing the long bevel down the backs and fronts of teeth, were used in filing the gullets down with a round file, or cutting them out carefully with a round face emery wheel, many saws would be saved and much less power consumed, as filing long bevels on the teeth forms square notches in the gullets, which will cause cracks to start, besides preventing free circulation of saw dust. See Cut C.



C. D.

The bevel on cross-cut saws should never extend into the gullets; in fact only the *points* of the teeth need beveling. The remainder of the tooth and gullets should be dressed straight across, as shown by cut D. In heavy cutting the front of the tooth should be filed with very little or no bevel, as shown in cut E. This will prevent much of the lateral strain and chattering caused by the teeth being forced out of line into the sides of the cut. Saws are frequently broken from this cause, particularly if they are dull. Many sawyers have adopted the method of filing every seventh tooth square, front and back. See cut F.

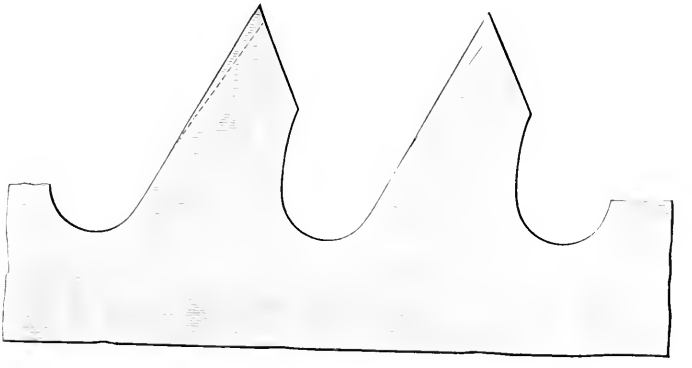


E. F.

This removes the core or V from the kerf and prevents much of the lateral strain; these teeth must be just a trifle shorter than those beveled.

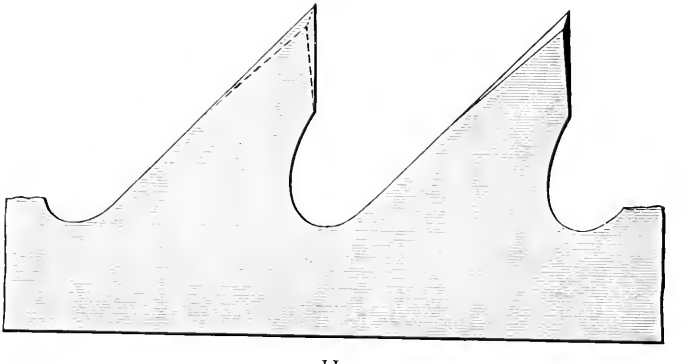
Since the introduction of emery wheels, saws of all kinds have been subjected to greater risks than formerly. The emery wheel, however, is here to stay, and the only thing to do is to give the saw a fair chance

in connection with its use. The rough, ragged edges, at least should be carefully removed with a file, and care taken that the steel is not case-hardened; in fact, saws under no circumstances should be subjected to a strain of any kind, direct from the use of an emery wheel or a punch gummer.



G.

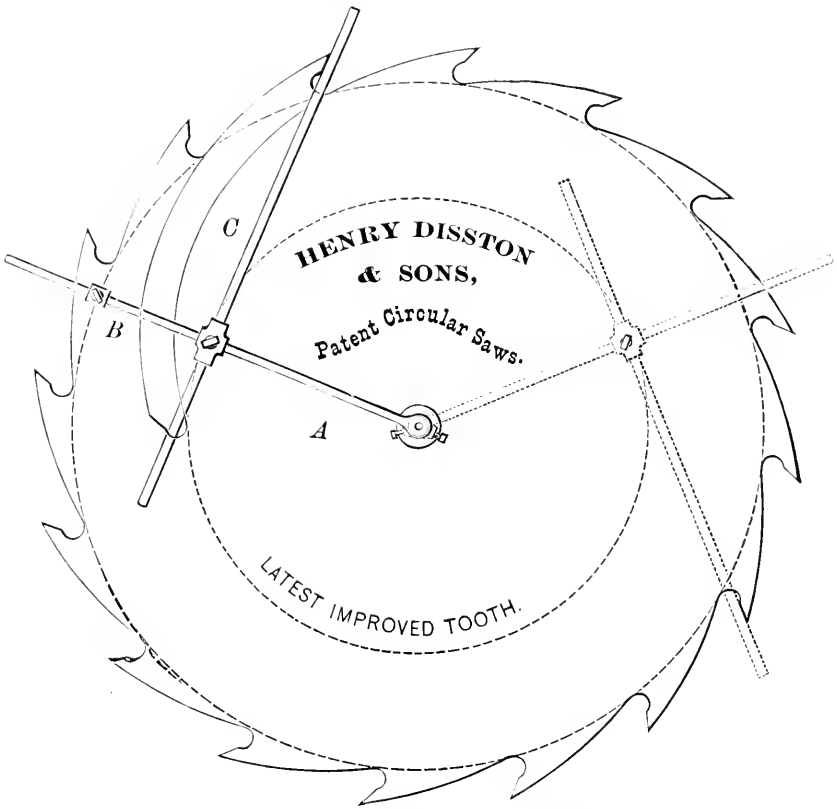
Cut-off saws, with the front of the tooth undercut into a round gullet, are the best (see cuts G and H). If the teeth are kept in this form, less time will be required in filing, and the bad results from running a dull saw would be prevented; use as little set as possible; file as soon as saw becomes dull, thus saving time and power, reducing the strain and liability of breakage of the saw.



H.

We can furnish cut-off saws with rounded or undercut gullets as shown above and give any desired amount of rake or space of teeth.

TRAMMEL FOR CIRCULAR SAW TEETH.

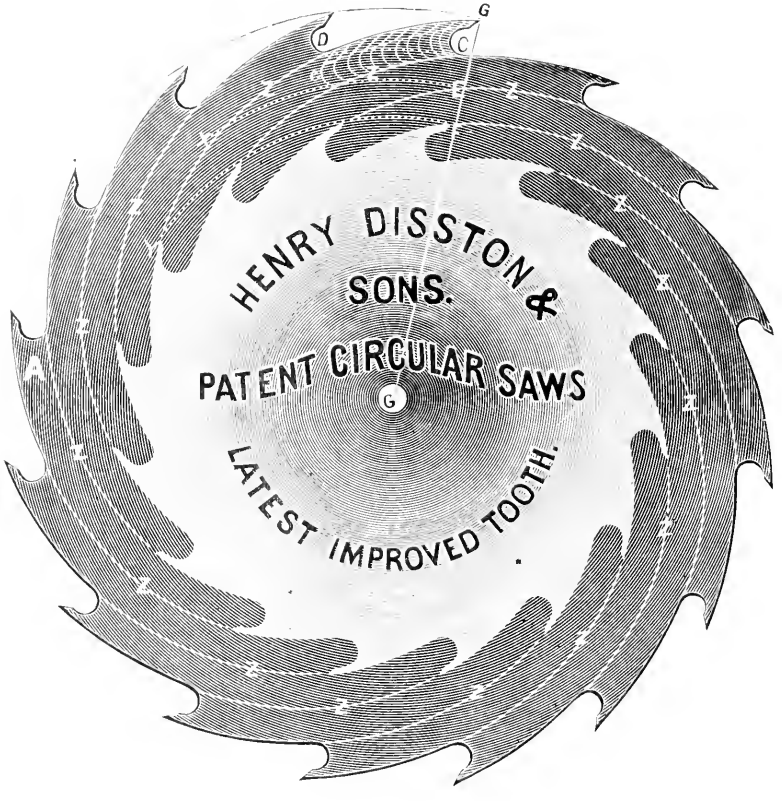


The above cut represents a device for laying out and keeping in order the teeth of circular saws. By its use the teeth can be kept in proper shape, regular in depth, and an equal amount of pitch given to the front of each tooth.

To rod *A* is attached chuck *B*, which holds a steel point for marking a circle for the bottom of the teeth. If all of the teeth are on this circle, they will be equal in depth. The strip of steel (*C*) can be set at any distance between the centre and the edge of the saw, and it will give the same pitch to the front of each tooth. The ordinary pitch is that which is obtained by placing the steel strip at a distance of three-fifths from the centre towards the edge of the saw-plate. There is a diversity of opinion concerning the proper pitch to be given to the fronts of teeth; knotty timber requires less than clear timber; with light power and light feed more can be used. The pitch can be increased by moving the steel strip nearer to the edge of the saw, but should the teeth become weakened, the backs or tops of the teeth should be strengthened, or they will either break or chatter in the work. Price, $2.50, net.

PATENT GULLET-TOOTH CIRCULAR SAW.

One of the most Valuable and Useful Improvements of the Age.



By reference to the above engraving, it will be observed that the back or point-line of each tooth is the continuation of the spiral lines *Z*, and the sharpening is mainly done by the reduction of the gullet or throat only. This is readily accomplished by the use of our patent gummers. (See pages 54 to 56.)

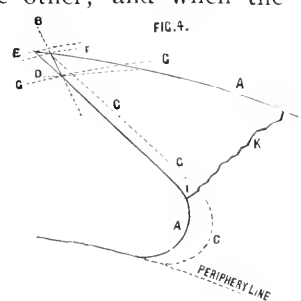
The course pursued by this cutter is spiral, and while it is in the act of reducing the front or throat of tooth *D*, it is prolonging the back or point-line of tooth *C*. The engraving represents a two-inch tooth or gullet. The saw *B* is the saw *A* worn down. When the saw has been reduced on centre line from *G* to *F*, it has been worn away but six inches, yet has presented a cutting surface on spiral line *Z* from *G* to *Y*, a distance of twenty-four inches. But this is only one of the advantages claimed for our patent gullet-tooth. The throat or gullet being

chambered out on a half circle, forms a larger receptacle or chamber for dust, and thus a one-and-a-half-inch tooth of this pattern will keep a saw as free from choking as a two-inch tooth of the ordinary shape.

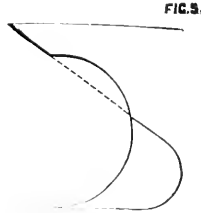
The saving of the saw-plate by the use of a smaller tooth is evident to the most casual observer.

Portable mills sawing hard and soft woods usually run a light feed. In this case a very shallow tooth is desirable. A shallow tooth will cut the smoothest lumber; but, if a heavy feed is carried a deeper chamber or more teeth is required. What we wish to do is to give a tooth, where we can, to suit the feed and kind of work.

In sharpening a great saving in time and files is effected by taking a good, deep, full cut, instead of a light, scraping one. As stated in a previous article, a tooth becomes dull on its face in proportion to the depth of cut taken at each revolution of the saw; for instance, when each tooth cuts a thirty-second of an inch, it takes thirty-two teeth to cut one inch, whereas when each tooth cuts one-eighth of an inch, it takes only eight teeth to cut the same amount. In other words, the fibre or grain of the lumber has to be broken thirty-two times in one instance, and only eight times in the other; and when the tooth starts to break the fibre one-eighth of an inch in the log, it will do it with nearly as much ease and consume very little more power than if the cut was a thirty-second of an inch. Of course one tooth, in this example, becomes dull for one-eighth of an inch under the point, and the other only one thirty-second of an inch, but it consumes as much saw-plate, time and files to bring up one tooth as the other; it is, however, easy to overdo the thing; there is reason in this as well as in anything else. On tooth, Fig. 4, dotted line *B* shows where the point first wears; dotted line *CCC* shows how it should be filed back on the periphery line; but, too frequently, on account of the long surface to be filed, operators file the top of the tooth only as represented by the dotted line *D*. It is plain to be seen that by filing back on the dotted line *CCC* you have only diminished your saw from dotted line *E* to *F*, while by filing from the top you have diminished your saw, as shown by dotted lines, from *E* to *D*.



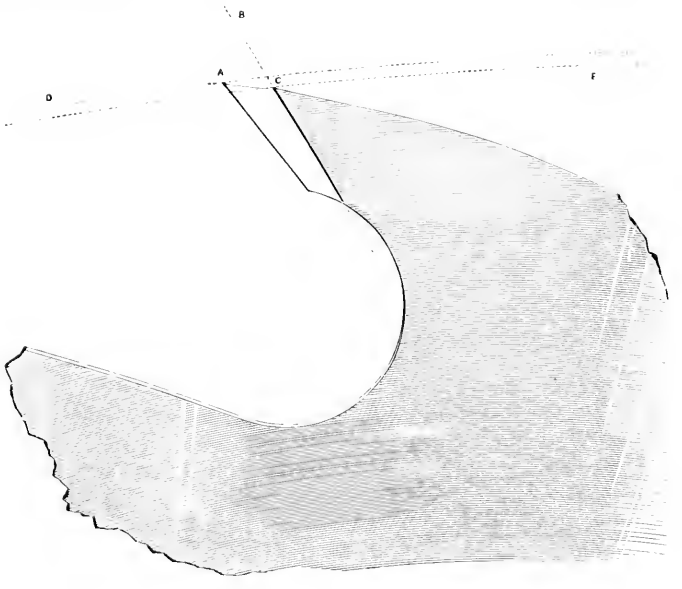
Filing back on the Periphery Line.



Showing Old and New Style Tooth.

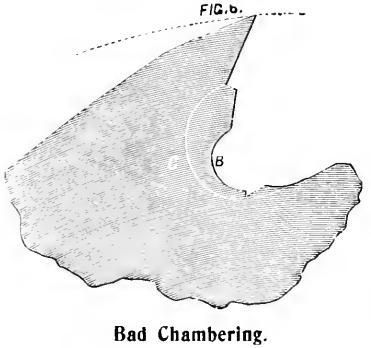
This shows that by filing on top five times as much of the saw has been wasted as by proper filing. This difficulty is overcome by the use of our new tooth, as represented by cut Fig. 5.

Fig. 5 shows the outlines of both straight tooth and the gullet tooth; by using the latter only a small space is left to file and gives no excuse for filing on top.



Engraving of Tooth after cutting 300,000 feet of Lumber.

The above cut represents a section of our gullet-tooth saw (kept in order by Chambering Machine) after cutting 300,000 feet of hemlock lumber. Dotted line *D* and point *A* show the original diameter of the saw; dotted line *E* and point *C* show the saw after cutting the above amount of lumber, only reducing the diameter of saw about three-sixteenths of an inch, as can be plainly seen between dotted lines *D* and *E*. According to this, a fifty-inch saw will cut 3,200,000 feet and only reduce the diameter of saw to forty-eight inches. You will thus perceive the great advantage derived by using our Patent Tooth and Gummer.



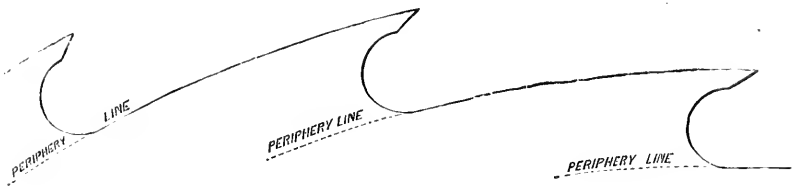
Bad Chambering.
(Reduced to one-half natural size.)

The accompanying cut is a facsimile of the condition of the teeth of a large circular saw sent to our factory to be gummed. The parties had been using some gummer upon the saw, which actually did more harm than good; as shown by line *B* the ragged throat so obstructed the circulation of saw dust that the parties were compelled to send it to the factory to be gummed out. Dotted line *C* shows the condition the gullet would have been in had our chambering machines been used upon it.

Figs. 7 and 8 show, by periphery lines, the difference in the wear of the saw. We will here remark that it is of the greatest import-

ance to file back on these periphery lines. It will be seen by this tooth the point on the face is very small. The smaller it is the less filing it takes to keep it sharp. One stroke of the file on this point will effect more than ten strokes on the face of a tooth that has to be kept back from point to bottom of gullet; and when there is so little point to

FIG. 7.

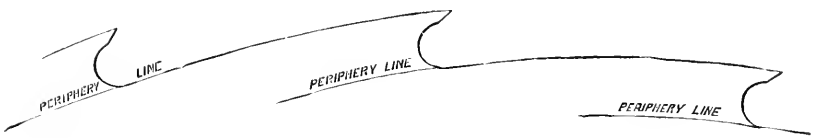


Tooth for Soft Wood.

keep back, it will be found easier to sharpen the saw from the face than to file from the top, and a saving in the diameter of saw is effected.

When we know the kind of lumber to be sawn, the speed, feed and capacity of mill, we will make the teeth best suited for the work, save waste of saw and extra time it would require to keep unsuitable teeth in order. For instance, for one-inch feed, we should not (where

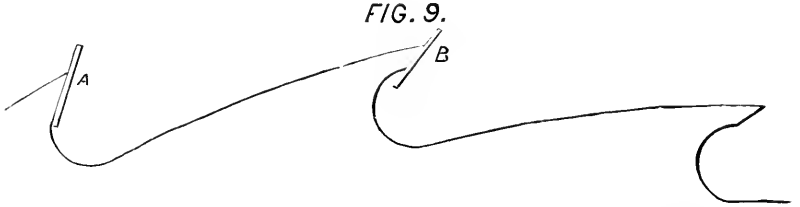
FIG. 8.



Teeth for Hard Wood.

our gummer is used) give over one-and-a-quarter-inch depth of tooth, for a five-inch feed, not less than fifty teeth, and depth to correspond; for a three-inch feed, we would give thirty-two teeth. The gullets of the saw should be chambered out, or gummed as soon as the teeth have

FIG. 9.



been worn back enough to allow the file to strike the back of the chamber as shown in Fig. 9, tooth *A*.

THE VICTOR PATENT SELF-FEEDING SAW GUMMER.

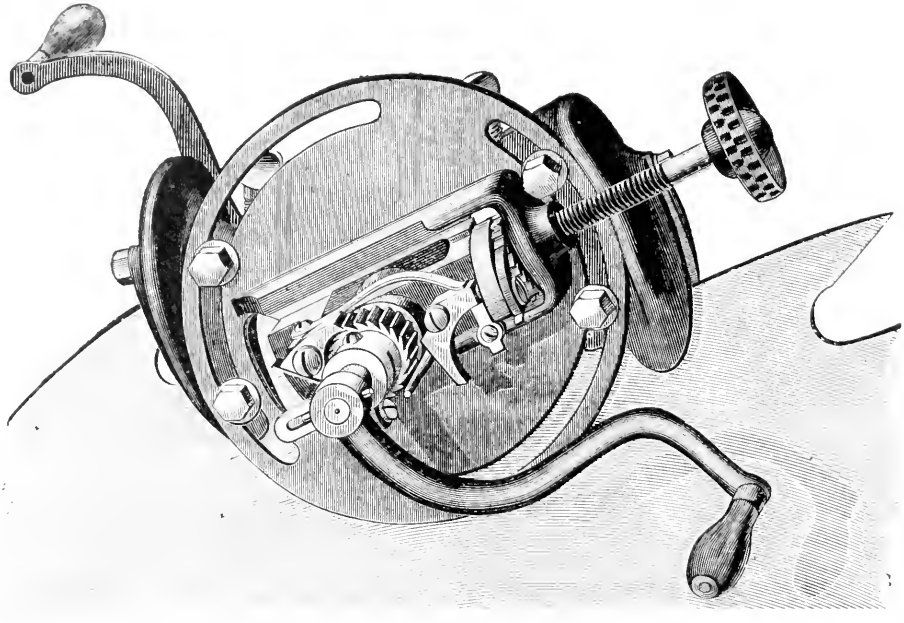


FIG. 1.

We call special attention to this machine, as being superior to any other gummer in the market; which fact will prove itself upon trial. The Victor is made of the very best material; the lighter parts being of malleable iron and the shaft of steel, making it lighter and at the same time stronger than other gummers. Its simplicity of construction makes it unnecessary to give any instruction for use, as an examination of the cuts will enable anybody to operate it. The Victor will gum all saws, from a small circular saw, with a $\frac{3}{8}$ inch gullet, to the largest made, with $1\frac{1}{2}$ inch gullet; also all mill, mulay and cross-cut saws. Cut No. 1 shows the Victor gummer in position for work on a sixty-inch circular saw, and No. 2 on a gang or mill saw. The self-feeding mechanism can be regulated to fast or slow speed without any change of parts, and the machine can be changed from hand to self feed in an instant. The adjustable stop throws out the feed pawl at any

THE VICTOR PATENT SELF-FEEDING SAW GUMMER.

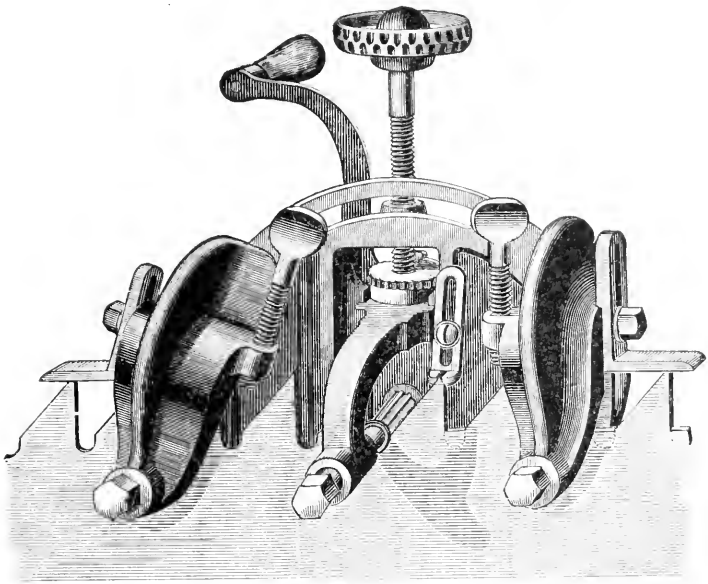
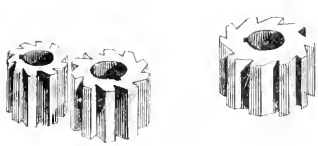


FIG. 2.

required depth of tooth. This gummer is fitted with three sizes of arbor. In ordering be sure to state which size is wanted. The large size is suitable for the following cutters: 1 inch, 1⅛ inch, 1¼ inch, 1⅜ inch, and 1½ inch. The medium size is suitable for ½ inch, ⅝ inch, ¾ inch, and ⅞ inch cutters. The small size is suitable for ⅜ inch cutters. Each gummer sent complete with one arbor of either size, three cutters, cutter grinder and wrench. Extra arbors furnished at $2.00 each. For range of work this machine has no superior.

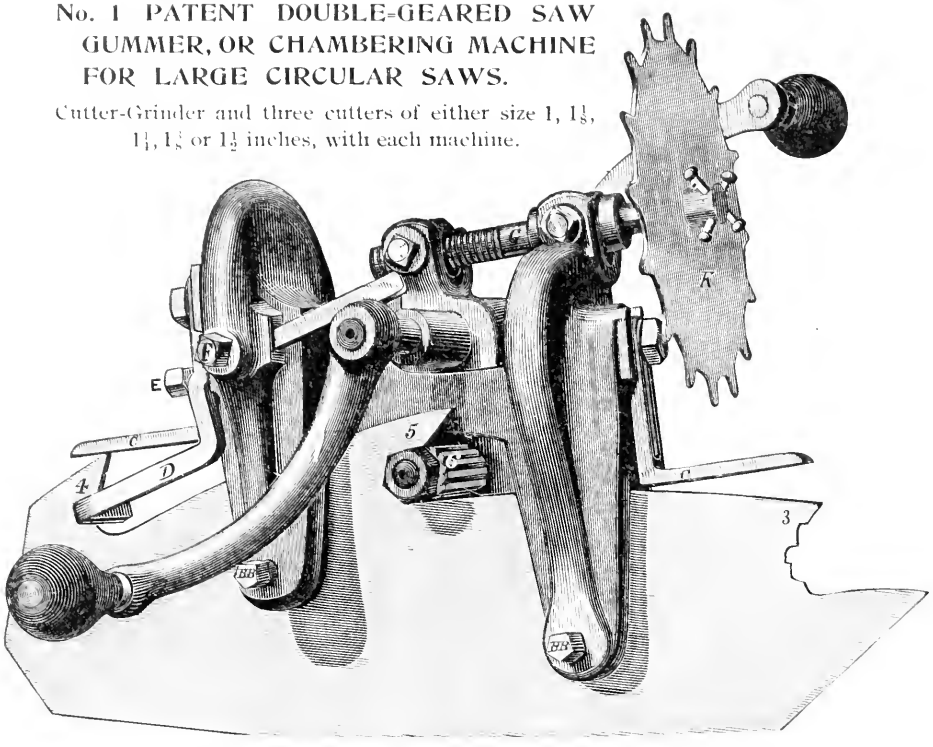
GUMMER CUTTERS.



When ordering state size of cutter and arbor hole.

No. 1 PATENT DOUBLE-GEARED SAW GUMMER, OR CHAMBERING MACHINE FOR LARGE CIRCULAR SAWS.

Cutter-Grinder and three cutters of either size 1, 1⅛, 1¼, 1⅜ or 1½ inches, with each machine.



DIRECTIONS FOR USING.

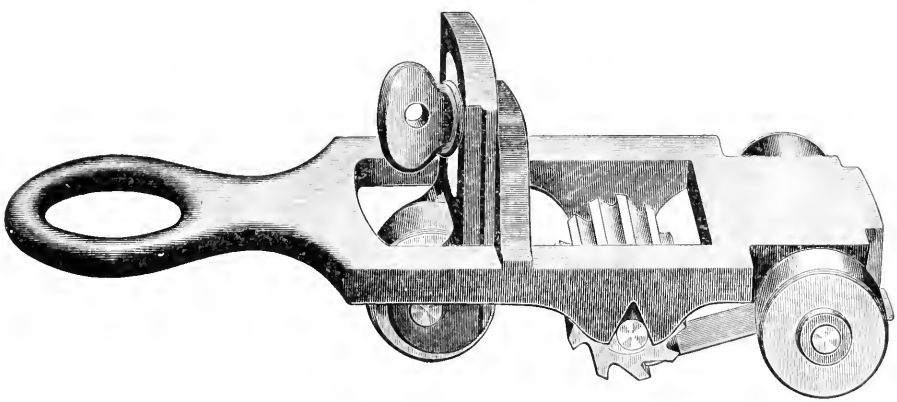
Before using the gummer see that the oil holes are clear. A few drops of oil will be sufficient for from three to five hours' use. After using the gummer remove the chips or turnings that accumulate back of the cutter. If allowed to remain they will cause trouble by getting into the working parts of the machine. Run the cutter back by means of screw *G* as far as necessary. Then place the machine on the saw, with the cutter close up in the chamber of the tooth to be gummed.

If the teeth are regular and the same distance apart, start the cutter in any chamber; but if they are irregular, make them even by commencing in the smallest tooth. After gumming the saw a few times the teeth must become regular. *E* is a set screw to regulate the depth of gullet. Fasten the machine to the saw by means of the screws *BB*, and proceed to gum the first tooth, one of the points of the star being struck at each revolution by a projection on the handle the cutter is steadily fed in until arrested by set screw *E*. Remove the machine to the next tooth, after having run the cutter back and proceed as before until all the teeth are gummed. Should the gullet or chamber be worn smooth, and the cutter fail to bite, rough the gullet with a file. The cutter is so arranged as to slide on its axis, and when one portion becomes dull, by removing a washer from back to front, a new sharp cutting surface will be presented, so continuing to change the washers until the whole face of the cutter becomes dull.

To take the cutter off the shaft, put the pin, hanging to the gummer, in the hole in the ratchet wheel *H*, to keep the shaft from turning while unscrewing the nut, which has a left-hand thread. The hand wheel on end of feed screw, outside of the star, is to allow the operator to feed easily and gently with the hand when starting in to cut rough gullets, until the cutter gets a bearing, when by tightening the jam-nut on opposite side of star, the machine is made self-feeding. The racket by which the cutter is moved, effectually prevents any back motion, which has hitherto been a serious objection.

This gummer is a most invaluable machine, and should be in the hands of every mill-man. It saves power, files and time, and is so simple in its mode of operation that any one of ordinary intelligence can be taught to use it. We pronounce this the best gummer ever manufactured.

CUTTER GRINDER FOR HOLDING THE CUTTER OF CHAMBERING MACHINE IN POSITION DURING PROCESS OF SHARPENING.

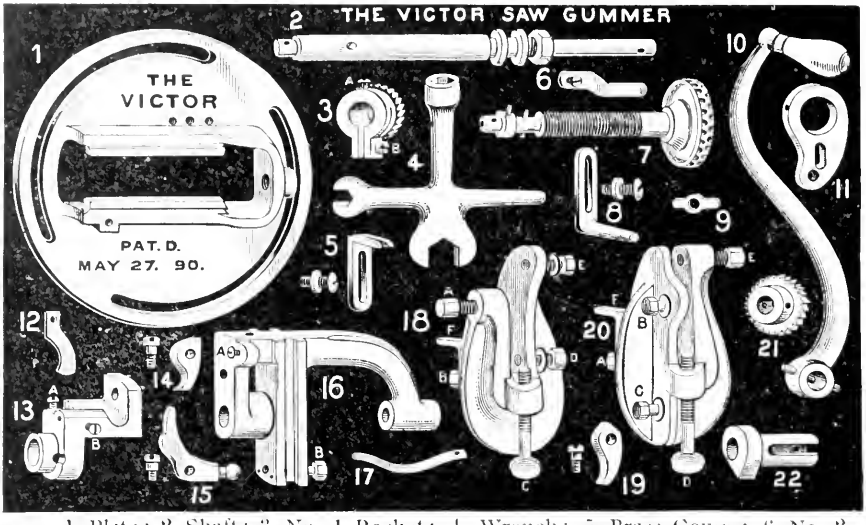


To Grind the Cutters

the stone should have a perfectly straight face and turn from the operator. Lower the adjustable frame of grinder until the cutter touches the stone, then adjust spring in proper position. When properly adjusted, the backs of teeth of cutters can be ground so the cutting edge will be a little the highest and the cutters round and sharp.

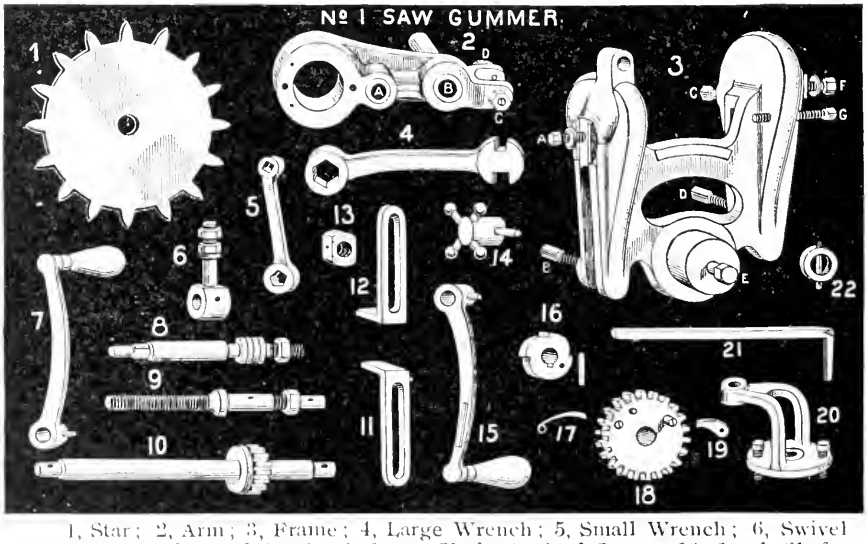
Furnished with either No. 1, 2 or 3 (Pin) shaft.

LIST OF PARTS OF VICTOR SAW GUMMER.



1, Plate; 2, Shaft; 3, No. 1 Rachet; 4, Wrench; 5, Brass Gauge; 6, No. 2 Ratchet Spring; 7, Feed Screw; 8, Stop Gauge; 9, Stop; 10, Crank; 11, Throw; 12, No. 1 Ratchet Spring; 13, Stand; 14, No. 1 Pawl; 15, Ball Lever; 16, Carriage; 17, Ball Lever Spring; 18, Long Clamp; 19, No. 2 Pawl; 20, Short Clamp; 21, No. 2 Feed Ratchet; 22, Cam.

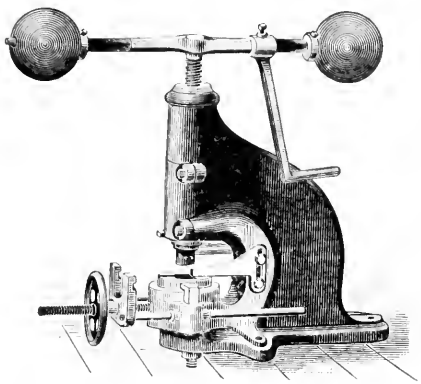
LIST OF PARTS OF No. 1 SAW GUMMER.



1, Star; 2, Arm; 3, Frame; 4, Large Wrench; 5, Small Wrench; 6, Swivel Bearing; 7, Left Hand Crank; 8, Cutter Shaft; 9, Feed Screw; 10, Crank Shaft; 11, Gauge; 12, Gauge; 13, Swivel Nut; 14, Cross Handle; 15, Right Hand Crank; 16, Ratchet; 17, Ratchet Spring; 18, Large Gear Wheel; 19, Pawl; 20, Out Bearing; 21, Wrought Iron Gauge; 22, Collar for Feed Screw.

When ordering, specify the No. of part wanted, whether for Victor or No. 1 Gummer. Prices quoted on application.

DISSTON HAND SCREW PRESS.



No. 2 Press, Fitted for Gumming Bandsaws.

This Press is made in two sizes or weights, and of a style rendering it strong and durable for punching, slotting, toothing or shearing purposes.

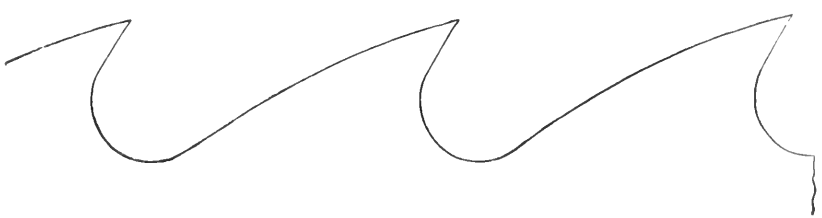
The No. 1 Press weighs 160 lbs., and is adapted for gumming saws or punching steel up to 5 gauge ($\frac{7}{32}$ inch) in thickness.

The No. 2 Press weighs 250 lbs. and will gum saws up to 8 gauge ($\frac{5}{32}$ inch) in thickness.

The above illustration shows the No. 2 Press fitted for retoothing Bandsaws. Special dies and punches, or shear blades, will be furnished on order.

This is a very desirable and powerful machine, and we recommend it as superior to any other pattern for retoothing Band, Gang and other saws, as well as for general purposes.

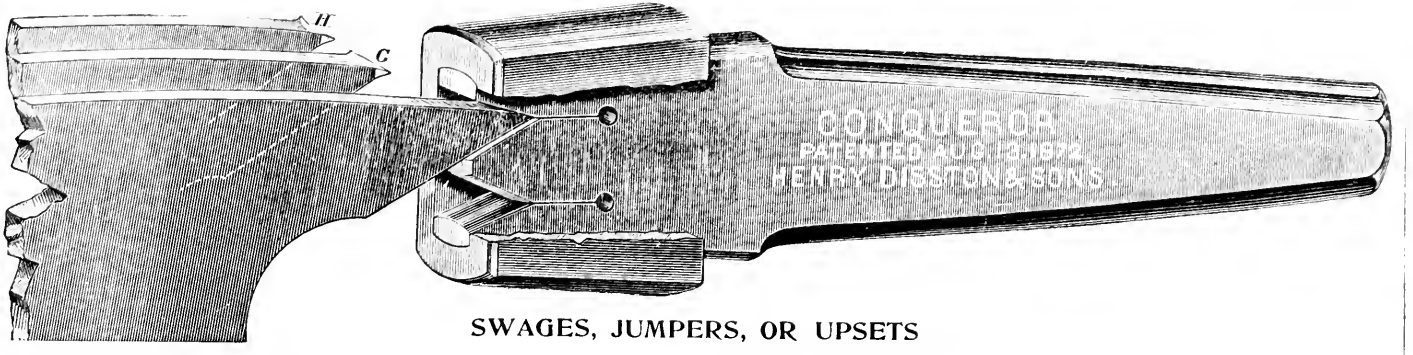
STANDARD SHAPE OF BANDSAW TOOTH.



Special shapes or spaced teeth made to order.

THE CONQUEROR SWAGE, JUMPER OR UPSET

No. 1. For large Circular Saws.

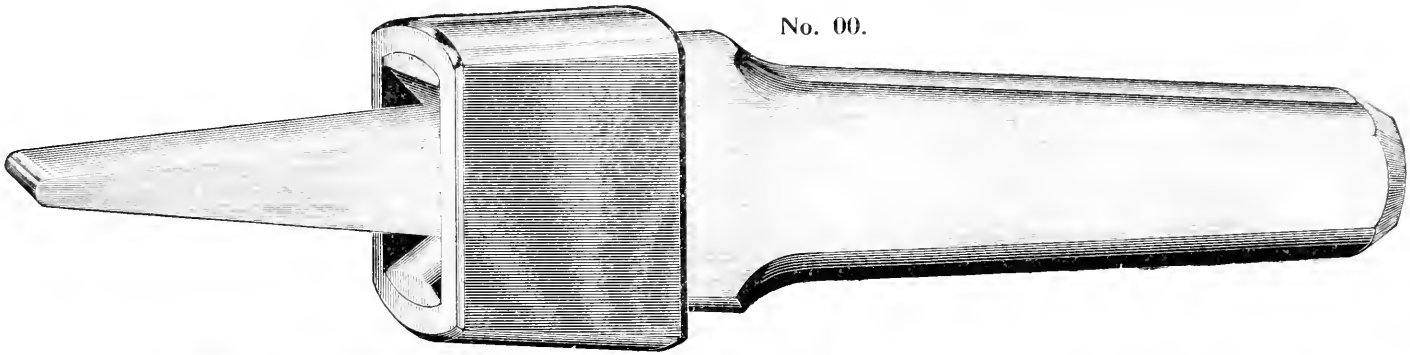


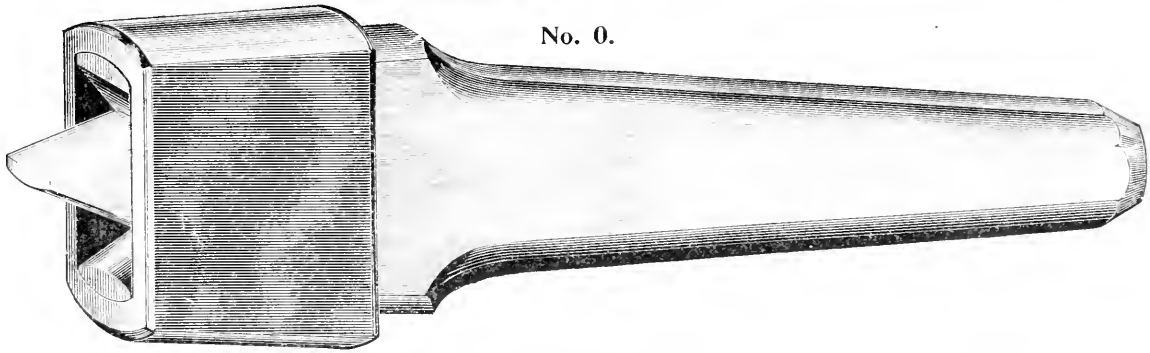
SWAGES, JUMPERS, OR UPSETS

Are for the purpose of spreading the points of the teeth and for bringing out corners reduced by wear, thus saving time, saw, and files, if properly used. Swaging has a tendency to close and toughen the grain of the steel. Of these useful tools we manufacture various kinds.

With confidence we recommend the Conquerer Swage to the trade, and guarantee its superiority. It is simple in construction, durable and effective. The lower opening, being rounding on the bottom, takes its bearing on the centre of the tooth, spreading and shaping it as shown in section of tooth *H*. The upper opening (in which section of tooth is inserted) is used for squaring-up, and leaves the tooth as shown at *G*.

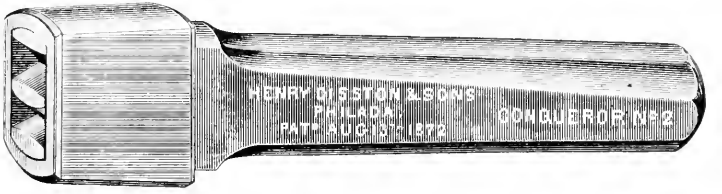
The bottom of the openings in the Conqueror being slotted, it is impossible to blunt or injure the fine-cutting edge of the tooth, which is frequently done by other swages. One of the principal drawbacks in the manufacture of solid swages has been the difficulty experienced in properly hardening them at the BOTTOM OF THE OPENING, which portion of the swage does all the work, and requires to be hardened in the most perfect manner. The Conqueror is hardened before the sleeve is driven on, and the hardening composition passes freely through the slots at the bottom of the openings, thus insuring an even and correct hardening. (See illustrations on next page).



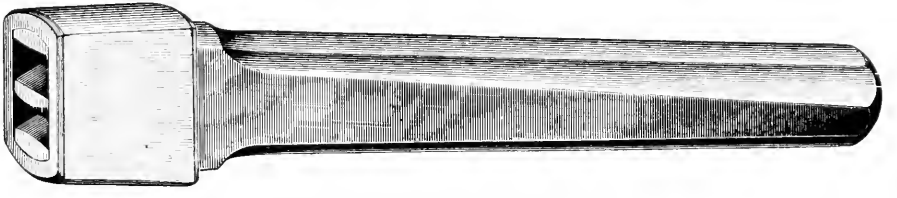


Special attention is called to the Conqueror Swages, Nos. 0 and 00 with projecting tongues. The tongue, resting on face of tooth, acts as a guide to obtain the proper angle for swaging. The Conqueror has given entire satisfaction, and is indispensable to any sawyer who uses the spread set. Every swage sold by us is warranted perfect, and to give satisfaction. The swages themselves shall be their own recommendation.

CONQUEROR SWAGE, JUMPER OR UPSET.



No. 2. For Small Circular and Mill Saws.

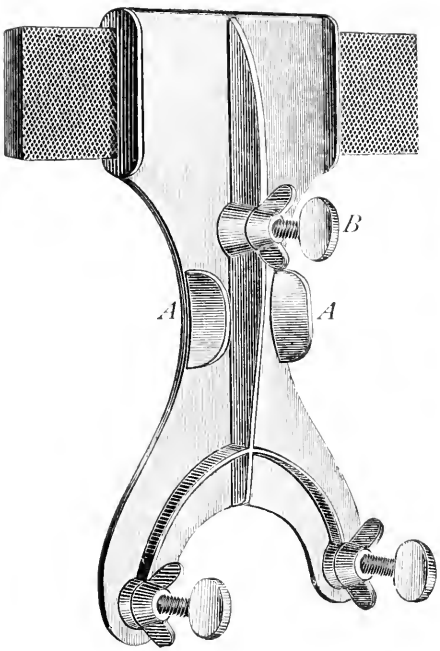


No. 4. For Band Saws.

No. 3. For Small Circular Saws.

No. 100 CHAMPION SAW-SET, for Cross-cut Saws.

SIDE-FILE.



Double Spread Tooth.

The Gridley Tooth.

Spring and Spread Tooth.

The above cuts show the different sets for saw teeth.

The dotted lines show the undercut.

Made in Three Sizes.

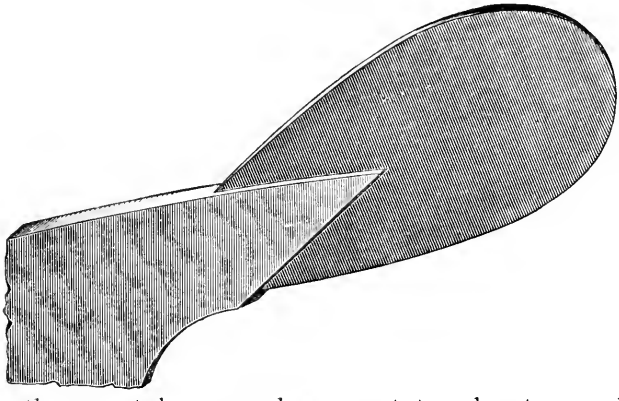
It is impossible to set or swage a saw so that some of the teeth will not overhang, or are not bent over or swaged more than others. The slightest difference in the temper or variation in shape causes the teeth to set mild or rigid; this defect in the set, no matter how slight, must produce rough lumber. The difficulty can be overcome by the use of our side-file, an instrument invaluable to every sawyer or lumberman. It is *used for the purpose of regulating saw teeth after they have been set*, and can be adjusted to any width of set required. It removes the extreme points, and brings every tooth in perfect line on a firm foundation and cutting-edge.

Every point is brought up to its work, leaving no vacant corners; no weak, flimsy, or extreme points, such as are left by the ordinary way of setting and sharpening. By the use of this tool, the set of every tooth is made even; a saw thus regulated will run longer without resharpening. The file must be so adjusted by means of the set screws as to conform to the width of set desired. The jam-nuts are for the purpose of securing the set screws in the desired position. When the side-file has been properly adjusted it must be held in position by means of the clips *A*, against the saw blade, the points of the set screws *B* only touching the blade. Each tooth in succession must be filed until the

set of the tooth conforms to the gauge of the set screws. Thus, all uneven or overhanging corners will be removed.

When ordering, state plainly whether holder is wanted or only file for holder, or the side-file complete, and diameter of saw for which it is to be used.

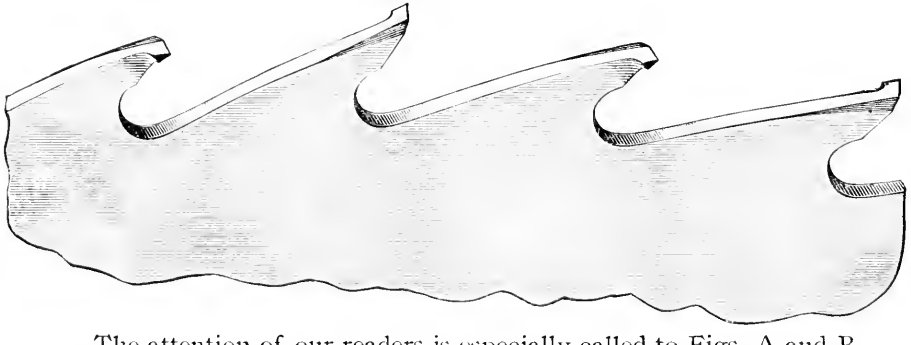
GAUGE BY WHICH TO FILE AND REGULATE THE SHAPE OF SAW-TEETH.



A tooth cannot be swaged or upset to advantage unless filed sharp and to the proper shape. To do this without a gauge requires considerable practice and experience. Taking for granted the back of the tooth is in good shape, the swaging must be done from the *under side;* this gives the proper rake and saves the saw. After the teeth are swaged, a few touches with the ordinary file and side-file complete the work. This gauge will be furnished gratuitously on application.

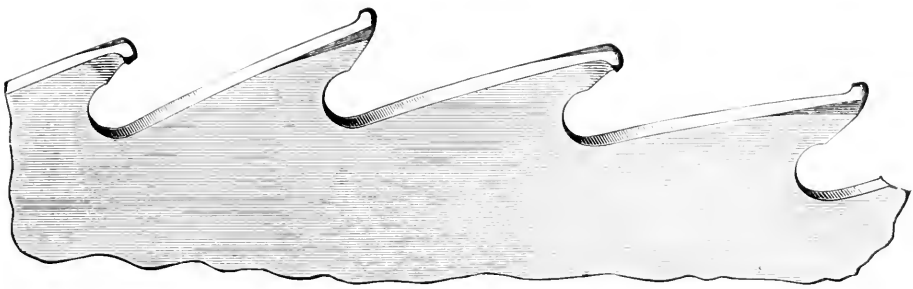
THE GRIDLEY TOOTH.

FIG. A.



The attention of our readers is especially called to Figs. A and B. They are representations of the Gridley tooth, spring and spread set

FIG. B.



combined. Fig. A represents a portion of a saw in proper order for work, and Fig. B shows how the teeth become worn and rounded by use. Where the power is light and the sawing tough, this tooth, kept in proper order, will accomplish wonders. *The cutting points must be kept up square and full*, as shown in Fig. A; for, when they become dull and rounded, as shown in Fig. B, it requires more power to run the saw, and makes inferior lumber.

In sharpening this or any other tooth, the filing should be done almost exclusively on the *under side;* the top should only be filed sufficiently to keep the tooth in proper shape.

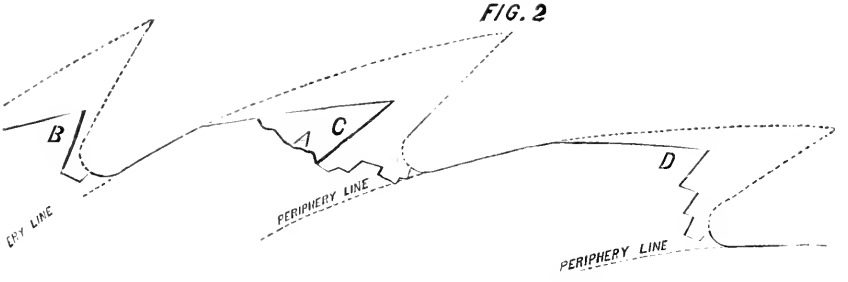
HOW TO FILE CIRCULAR SAWS.

In a great many instances the persons who file circular saws pay no regard to the shape of the teeth; they get them into all kinds of shapes but the right one, as shown in engravings on next page.

The dotted lines on Fig. 2, page 45, represent the teeth in proper shape as they leave the factory; and the lines at *B*, *C* and *D* show the condition in which they are frequently sent to us for repair. In these teeth there is no chamber for the circulation of dust. At the same time this kind of filing wears away the saw five times as fast, and consumes three times as many files as would be required to do the work properly. But these are only a portion of the evil results. Teeth filed with sharp, square corners at the bottom frequently break, as shown at *A*, tooth *C*. It is lamentable to see this state of things when it can be so easily avoided.

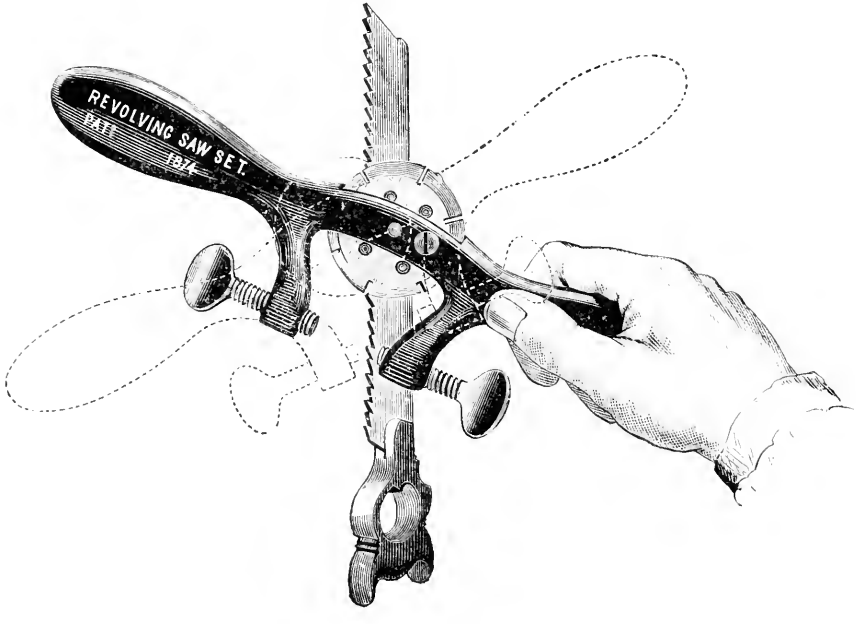
We have many saws returned for repairs, that break in cold weather by reason of these sharp corners. They are ruinous to the saw in many ways. If the teeth are kept in the shape they leave us, this trouble and expense will be avoided. The moment the teeth commence

FIG. 2



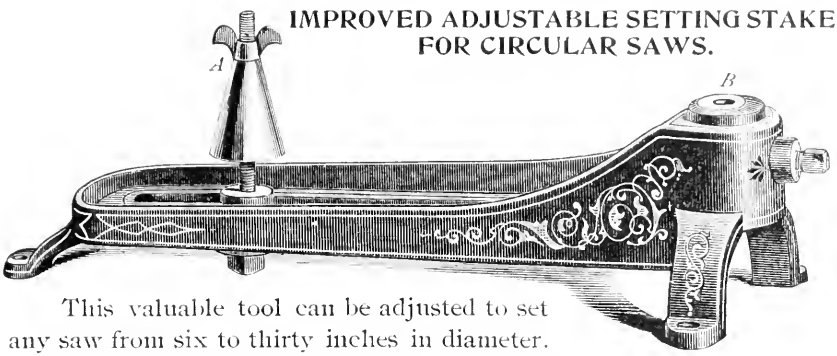
to get in bad shape, the saw begins to suffer in diameter, from the fact that the filer, wishing to get his points sharp with least amount of filing, files from the top instead of the face of the tooth. This does not help him one particle, but rather the reverse; and every stroke of the file on the top wears the saw away more than five strokes on the face or under side of the tooth.

REVOLVING SAW-SET.



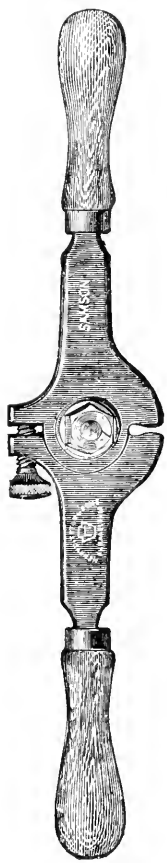
A good set for small circular saws, or saws with small teeth.

IMPROVED ADJUSTABLE SETTING STAKE FOR CIRCULAR SAWS.



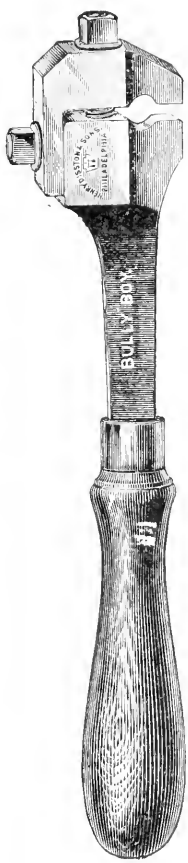
This valuable tool can be adjusted to set any saw from six to thirty inches in diameter. The cone *A* is moved in or out to suit the diameter of the saw, and raised or lowered as may be required. The moveable anvil at *B* is made of hardened steel, and some portions of the face being beveled more than others, the operator can regulate the amount of set as desired.

SAMSON SAW-SET.



It is made of the best refined cast-steel, in two sections, and united in the centre by a bolt, which serves as an axis; thus it can readily be adjusted by means of the set-screw to suit the thickness or gauge of any saw.

THE BULLY BOY.



This is a saw-set that can be relied on to give satisfaction, particularly where the nature of the work will not admit the use of a two-handed, or longer set.

HAMMERING AND ADJUSTING CIRCULAR SAWS.

The many inquiries we have in regard to the method of hammering and adjusting the tension in saws has induced us to print a few simple instructions on the subject, which if carefully followed can not be otherwise than a benefit to beginners and others seeking information in this line. All saws of whatsoever kind, if properly made, are what we will call "loose," through or towards the centre to suit the different kinds of work for which they are intended. The object is to keep the edge strained on a straight line, to prevent it from chattering or cutting a zig-zag kerf through the timber; what applies to any one kind of saw in the method of hammering, applies to all. The circular saw, however, is the most difficult to treat, and even after the most careful instructions we could give, would require practical experience and close observation on the part of those having these saws in charge, before they can successfully hammer them.

The strain in running and the process of gumming will stretch the edge of the saw and it will begin to run snakey, rattle in the guides and make bad lumber. However, before concluding that the saw must be hammered to adjust the tension, see if there is not some other cause for the trouble, such as improper lining, the adjustment of the guides, the collars; the saw out of balance and the dressing of the teeth; these matters, however, are all referred to in this hand-book, and are only mentioned here for those who have not had experience. Our object being to treat here on the hammering necessary to keep the saw true and in proper tension, which means that it must be open sufficiently and properly from the edge towards the centre to suit the motion of saw and feed of the mill.

What is required in the way of tools is an anvil, one round-face and one cross-face hammer, two straight-edges, one from 14 to 18 inches long, one about 48 inches long, and one try-mandrel; we find that these tools for fitting up saws are being put in many of the large mills; the men who handle the saws are making themselves proficient in the hammering of the saws to suit their wants; this knowledge they have acquired by perseverance and practical experience, the only way in which it can be obtained.

In studying the matter of how to hammer circular saws, it would be as well for those who have to take charge of them, to examine the saws as to the tension when first received, taking for granted that they are

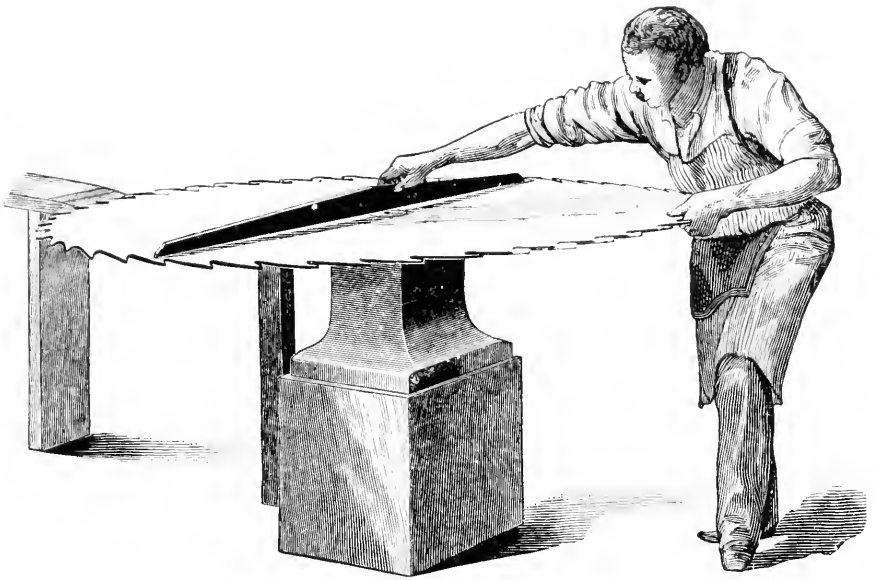


FIG. 1.

right as to the hammering when they leave the maker; for all the saws

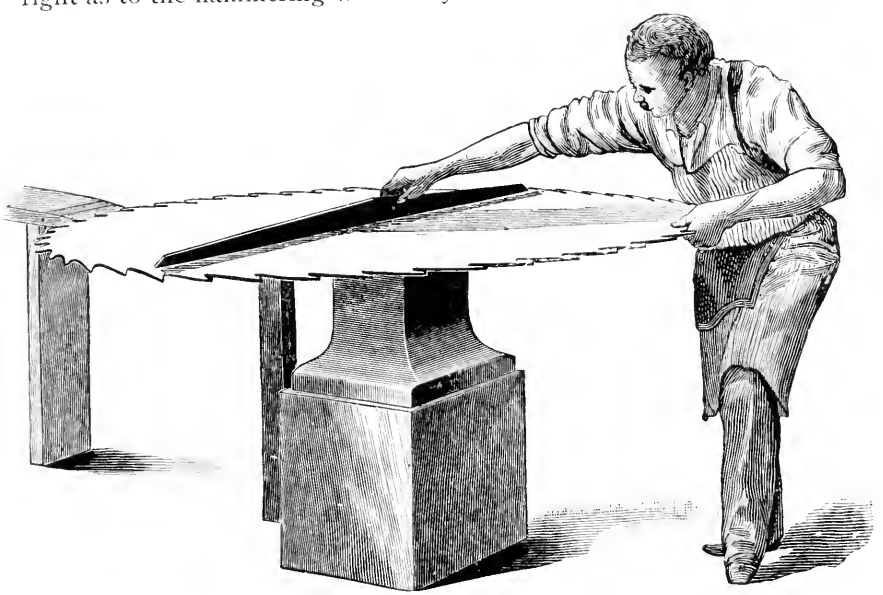


FIG. 2.

made by us will be as true as it is possible to make them, and will appear for tension as shown by figure 1 to a greater or less extent, according to the speed and feed to be used. A saw that has lost its tension will show as at figure 2 and needs hammering with a round-face

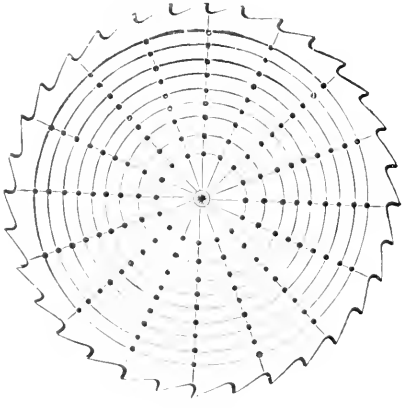


FIG. 3.

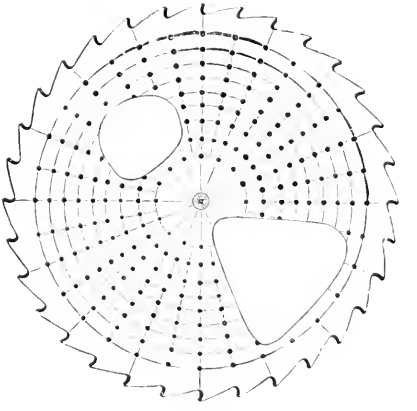


FIG. 4.

hammer, as shown by figure 3, but before commencing to hammer to restore the tension, examine or test the saw all around as in figure 5, and if any part of the saw between edge and centre falls away from the straight-edge, mark around this spot as shown by figure 4, and do not

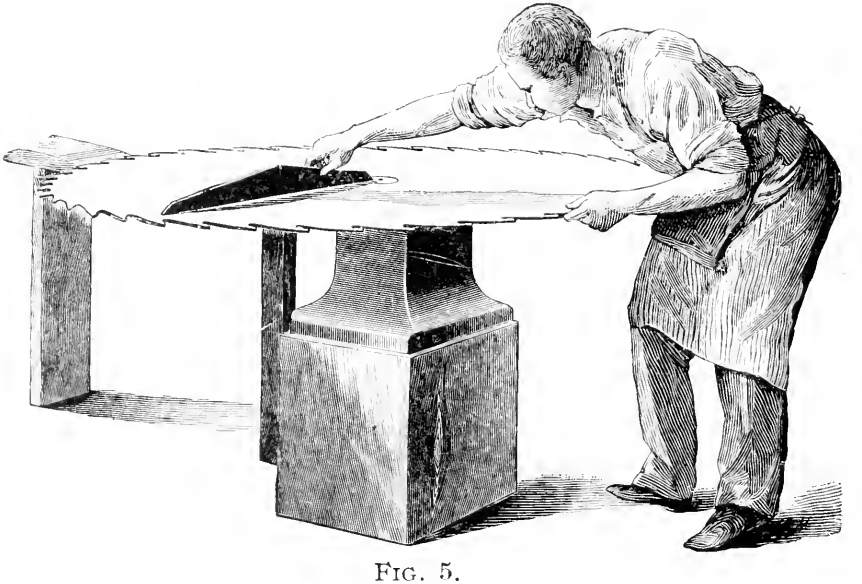


FIG. 5.

hammer as much, if any, at that place. In testing for the tension, be sure to have the straight-edge at right angles with that part of the saw resting on the board and the opposite edge which is being raised with the left hand, while the straight-edge is held and gently pressed down

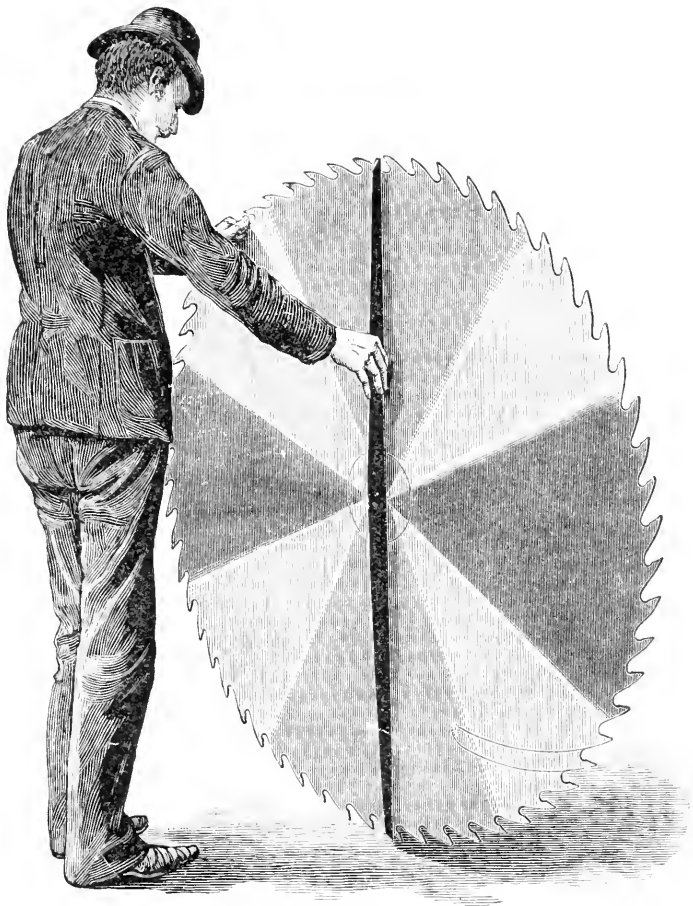


FIG. 6.

with the right hand. Do not lean the straight-edge to one side but hold it up straight, or it will fall to the form of the saw and not show what is desired. A straight-edge reaching from the centre hole well out to the edge of the saw is the best to use in hammering to regulate the tension, and when this straight-edge is applied as above, the saw

should fall away from a straight line as shown by figure 5; this will show that the centre of the saw is stiff, as it must always be to run properly and do good work, and if a short straight-edge about 6 inches long was pressed directly over the centre, it would show the saw to be nearly flat or of equal tension at that part. We will here say that it is very seldom necessary to hammer a saw at the part covered by the collars.

When ready to hammer, as at figure 3, see that the face of hammer is ground so that the blow will be round and do not strike too heavy, for it is better to go over the saw a number of times than to

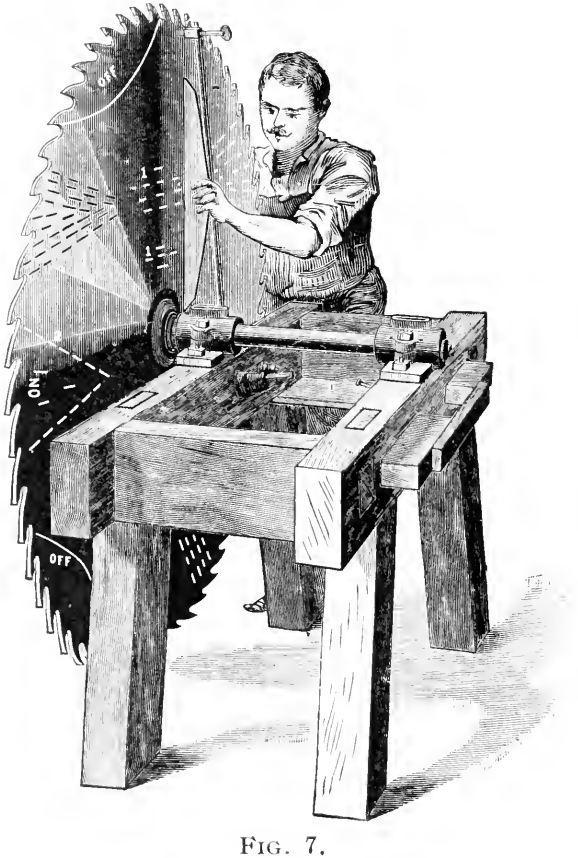


FIG. 7.

hammer too much at one operation, and put the saw in worse shape than it was before it was hammered.

After hammering one side, mark off the other side and repeat the operation with as near as possible the same number and weight of

blows as struck on the first side and as directly over them as can be done. Now, stand the saw on the floor; hold it up straight and test it with the long straight-edge as shown by figure 6; if the hammering has been done alike on both sides, the saw will be very nearly true; if, however, it shows full on one side and dishing on the other, mark these places that are full.

Place the saw on the anvil with the round side up; hammer lightly on full places; test again with the long straight-edge, and if it appears true, put it on the anvil and test it as explained, to see if it has the proper tension; if not, repeat the operation with the round-face hammer until desired tension is obtained. After again testing with long straight-edge, put the saw on the try-mandrel to test it with the short straight-edge for running true. This mandrel must also be true,

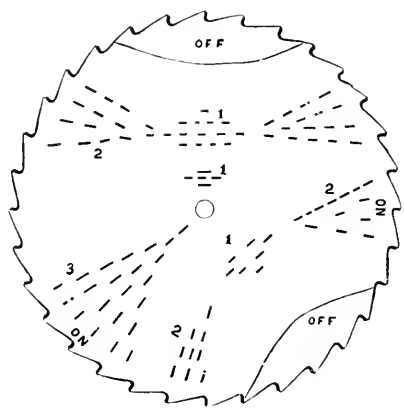


FIG. 8.

which can be determined by changing the position of the saw on the mandrel to see if the same parts of the saw run off and on at the pointer. Mark the places as they run on or off as shown by figure 7, while turning the saw slowly around, and where the saw runs off, lumps will be found most likely as at 1, 1, 1, or what is termed twist lumps as at 2, 2, 2 of figure 8, or both may occur; these lumps must be taken out with a cross-face hammer and struck as shown in the direction that the straight-edge shows the lumps to run. The saw may also be thrown out of true by lumps running toward the centre as No. 3, figure 8; in this case the saw will be on or off at points about opposite each other. This part of the hammering must be done carefully, and if the hammer is of the proper weight and the face properly ground, the saw can be made to run true without altering the tension to any

great extent. The testing on the mandrel by an inexperienced hand should be done with the full side of the saw towards the pointer, and by knocking down the lumps from that side, will make the plate flat; when the saw is fairly flat, test from both sides and operate in like

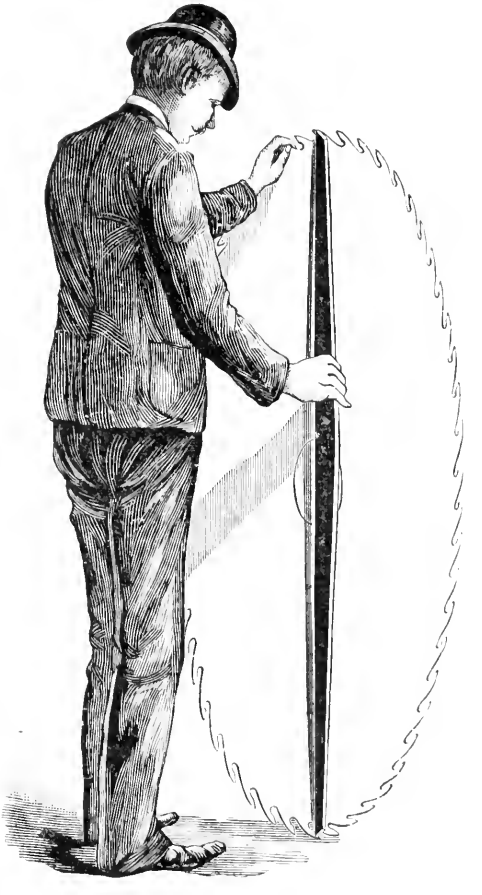


FIG. 9.

manner and get same results. Now put saw on the arbor and if for a high motion, it will sway gently from side to side in getting up to ful. speed and then run steady and do its work, but if it acts as heretofore stated (runs snakey and rattles in the guides), it needs to be made more open toward the centre. An experienced man, however, will stand the saw on the floor, taking hold at the top edge and give it a sudden shake, and if the centre vibrates and the edge stands stiff, he

knows it to be open towards the centre. He will also test by leaning the saw over, to see if it falls away from the straight-edge sufficiently as shown by figure 9, and consequently knows it to be right before putting it on the arbor. If the saw is too open at the centre it will run from side to side, mostly out of the log, and needs to be hammered as shown by figure 10, and the distance to hammer in from the edge depends upon where the loose parts are on the saw; if the centre is loose on line 1, hammer to that line; if to line 2 or 3, hammer to those

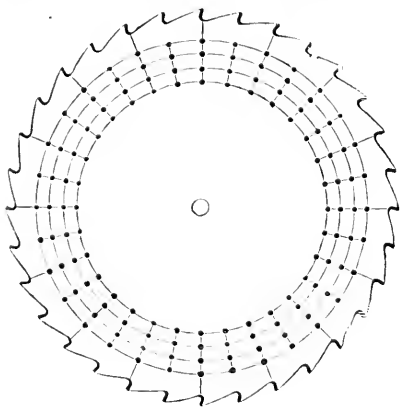


FIG. 10.

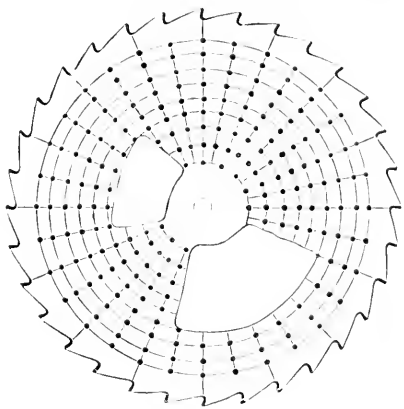


FIG. 11.

lines, or the looseness may be irregular, as shown by figure 11, and needs to be hammered as shown to regulate the tension; after this is done proceed, as explained, with cross-face hammer to free saw from twists and lumps to make it run true. If the saw should be buckled by an accident, true it with the cross-face hammer as explained by figures 6, 7 and 8 before regulating tension and final truing; do the same in case of buckling by burned spots or sharp lumps over the collar line; to remove or level these lumps, lay two thicknesses of strong, heavy paper on the anvil, place the saw on the anvil with the spot or lump resting on the paper and by giving a few well directed blows the lumps can be hammered down without expanding the metal as it would if straightened on the bare face of anvil. When hammering with the round-face hammer, work on lines drawn from the edge towards the centre; this will prevent putting twist lumps in the saw and obviate much of the trouble in truing with cross-face hammer. It is very important to have the blows distributed properly over the surface to be hammered. Hammering too much at one place would cause a loose spot or lump that would be difficult to take out, or burn a blue spot on the saw in the cut.

If it is necessary to go over the hammering more than once for tension, make lines between those that have already been operated on.

The dressing of the faces of the hammers is important; the round face should be nicely rounded so that if a light blow was struck on the oiled surface of the saw, it should show about half inch in diameter; the cross-face so that it would show a blow three-quarter by three-eighth inch, for a sharp cutting blow is not effective in either knocking down a lump or stretching the metal.

In concluding to these instructions, we make the following suggestions to beginners:

Do not be discouraged by the failure of first attempts; make yourself perfectly familiar with instructions given and persevere in properly applying them.

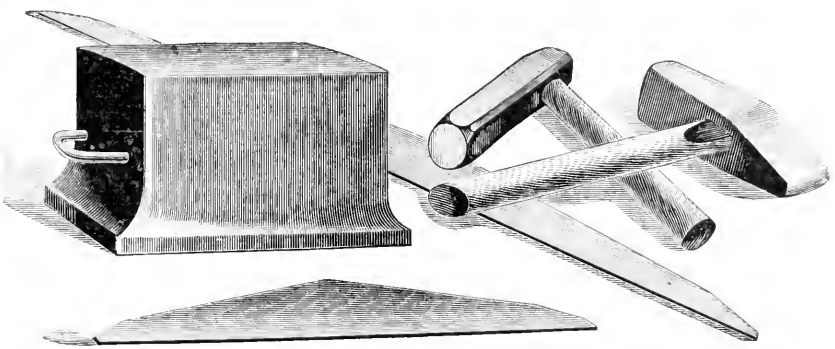
Carefully study the amount of opening the saw requires towards the centre for tension to suit the motion and feed used, and for regulating this, always use the round-face hammer.

The stem of the try-mandrel need only be one inch or less in diameter and bushings used for larger arbor holes.

Beginners in the art of hammering should take a small circular cross-cut saw (for this class of saws, as a rule, are given very little attention in the mills), one that can be easily handled; go through the operation as instructed and, if successful it will show advancement in the art and the ability to operate on larger saws without the same risk of failure.

In regard to large Circular saws cracking and breaking over the collar line; the saws when first put in use have been hammered, or left open enough for a certain speed. If the speed is reduced while in the cut, the saw will run either in or out of the log (most generally out), forming as it were, a wedge between the saw and headblocks, eventually cracking or breaking the saw at or near the collar line by forcing it over this rigid point, hence the importance of maintaining a uniform speed and having the tension adapted to it. In mills where steam feed is used great care should be taken not to crowd the feed on the saw when it looses its speed from any cause, such as insufficient boiler, engine or belt power, for if the feed is not decreased in proportion to the speed, the saw will be "crowded out" and forced over the collar the same as though the tension was not properly adjusted.

ANVIL, HAMMERS and STRAIGHT EDGES for REPAIRING SAWS.



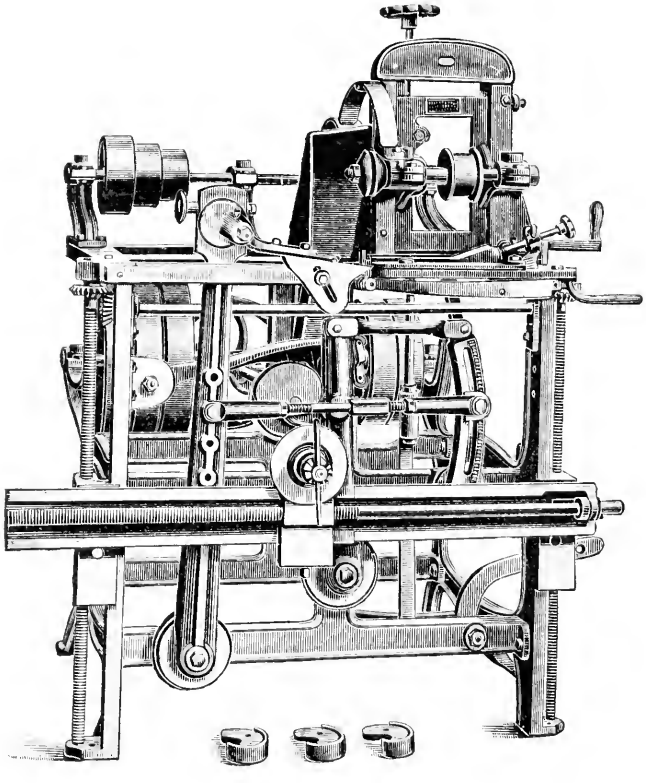
The above cut represents the tools necessary for altering or adjusting the tension of circular saws. (See page 68).

SWAGE BAR AND HAMMER.

The above cut represents our swage bar and hammer for use on circular and gang saws. We make the hammers in two sizes; the bars of any shape, size or weight desired.

Automatic Sharpener.

FOR CIRCULAR SAWS.

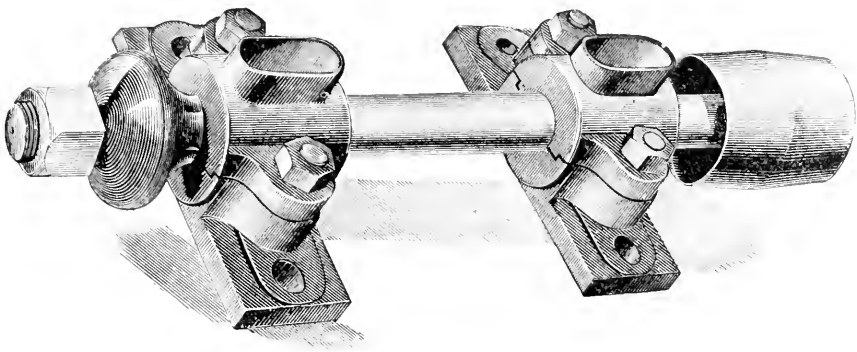


By the use of this machine the teeth are kept of the same shape and size throughout.

The gate is so inclined that the wheel drops to the throat before it comes in contact with the face of the tooth, thus avoiding burning or case-hardening the points of the teeth.

We are prepared to supply machines for sharpening all kinds and sizes of saws. Detailed description with prices, directions for operating, etc., will be furnished on application.

CIRCULAR SAW MANDRELS, with pulley on end.
Of the Latest and Most approved Style.

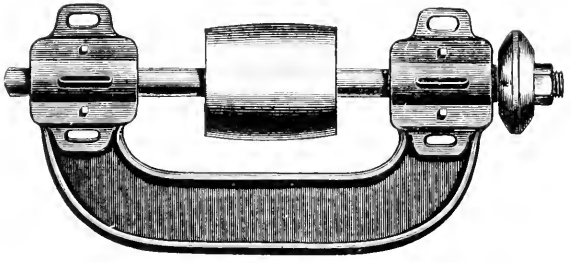


Our stock mandrels with pulley on end or in centre range in sizes suitable for saws 10 to 38 inches in diameter. Special sizes made to order.

A mandrel should not be too light for the work to be done or it will spring, causing it to heat. See that the bearings are well proportioned and fitted. All bearings should be at least three times as long as diameter of mandrel: longer would be no detriment. The boxes should fit neatly enough to prevent lost motion, but not so tightly on the quarters as to cut off the supply of oil. One of the main causes of mandrels heating is want of proper lubrication. The cutting of channels from the front side of bottom half of boxes running down and under shaft to point of hardest bearing will be a great benefit in all cases; then use a good heavy body oil or lubricant. In some mills where three bearings are used on the mandrel, heating is caused by getting bearings out of line when shifting for lead or adjustment. Again, some arbors have the collars for preventing end motion against the box nearest the saw; they should be on the other end, as the bearing nearest the saw has the most strain on it at all times. Heating is often caused by a short and tight belt; where there is trouble with a heating journal and slipping belt, it would be advisable, as well as economy, to increase the diameter of the receiving pulley on mandrel, even at the sacrifice of some of the speed. Belts should be of good length, and in all cases should have the strain on the lower side and slack on the top; then when practicable, put a balanced tightener or stress pulley on the top, placing it so that it will give as much lap of belt on the pulley as possible; this, with the balanced tightener, will take much strain off the mandrel, rendering it less liable to heat. A saw running badly from other causes, by undue crowding and straining, will frequently cause a mandrel to heat that would otherwise run cool. See suggestions on keeping saw and mill in order.

YOKE MANDREL.

Cast Steel.



CAST STEEL MANDREL.

Connected Boxes.

Size of Saw.	Diameter of Pulley.	Face of Pulley.	Diameter of Collar.	Diameter of Shaft.	Hole in Saw.	Cast Steel Mandrel Distance from Pulley to Saw.	Yoke Mandrel Distance from end of Shaft to Saw.
No. 1, 10 in.	4 in.	4½ in.	3 in.	1 1/16 in.	1 in.	18 in.	17 in.
" 2, 14 in.	4½ "	5 "	3½ "	1 3/16 "	1⅛ "	21 "	20 "
" 3, 18 in.	5 "	5 "	4 "	1 5/16 "	1¼ "	24 "	23 "
" 4, 24 in.	6 "	6½ "	4½ "	1 7/16 "	1⅜ "	26 "	25 "
" 5, 28 in.	7 "	7 "	5 "	1 9/16 "	1½ "	28 "	27 "
" 6, 36 in.	8 "	8 "	5½ "	1 11/16 "	1⅝ "	30 "	29 "

Measurements for length are taken from inside edge of pulley to saw.

The boxes of these mandrels being yoked or connected makes it impossible for the journals to get out of line with each other, as frequently occurs in small table mandrels.

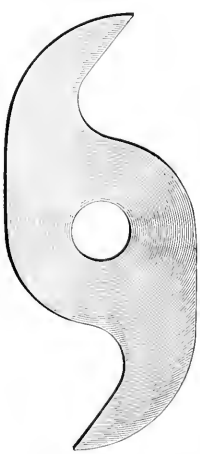
KEYSTONE GROOVER HEAD.

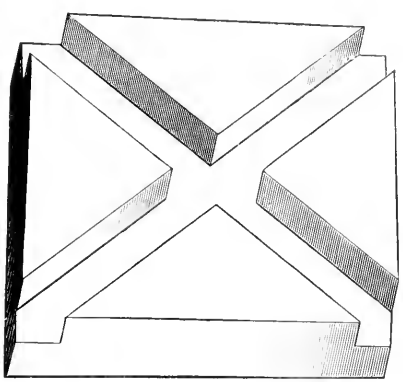
For Cutting Grooves from ⅛ inch wide to any width desired.

OUTSIDE CUTTER.

GROOVER HEAD COMPLETE.

Showing outline of inside cutter.

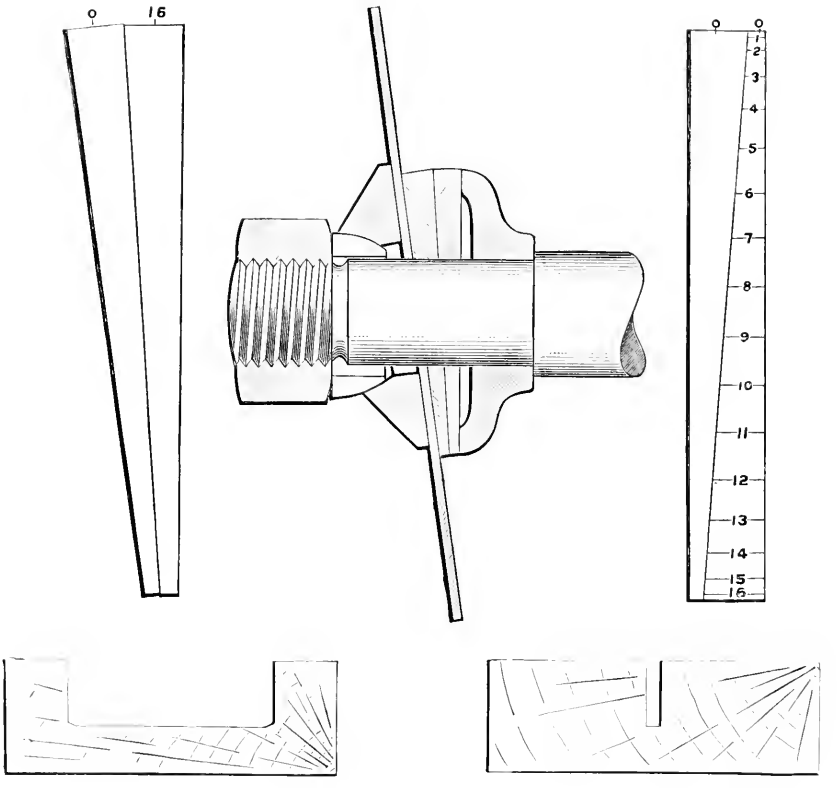




INSIDE CUTTER.

All inside and outside cutters are ⅛ inch thick except one only inside cutter which is $\frac{1}{16}$ inch thick thus permitting the cutting of any size groove varying by sixteenths from ⅛ inch to any width desired by using necessary number of inside cutters.

WABBLE SAW.



The above cut represents a Wabble Saw thrown from a perpendicular to a given angle with the axis of the arbor.

The purpose is to produce a channel or kerf exceeding in width the thickness of the saw or its set. Two collars are furnished, turned equal tapers, one of which is marked 0, the other is graduated from 0 to 16 upon part of its periphery, for the purpose of establishing a known width of channel or kerf, for a given size saw. Set the collars at 0, and the saw will run perpendicular to its axis, or, produce a kerf equal to the thickness of the saw or its set. The angle of the saw may be varied by moving the taper collars in opposite directions to any desired width of kerf within the reach of the taper collars.

The graduation marked on collars, enables the operator to reproduce the same effect at any future time with same size saw. The saw and taper collars are held in place against a fast collar on arbor with a ball and socket joint collar, to present a flat surface to the binder nut irrespective of the angle the saw may stand to the axis of the arbor.

GROOVING SAWS.

These useful little tools are too well known to require special mention. They are ground thinner at centre than at rim, so that little or no set is required or just sufficient to keep the extreme points of teeth perceptibly wider than body of tooth. We make them any gauge at edge or centre as may be wanted. In ordering grooving saws, state whether wanted straight or hollow ground, if the latter, give size of collar.

CORK, LEATHER, PAPER OR CLOTH KNIVES.

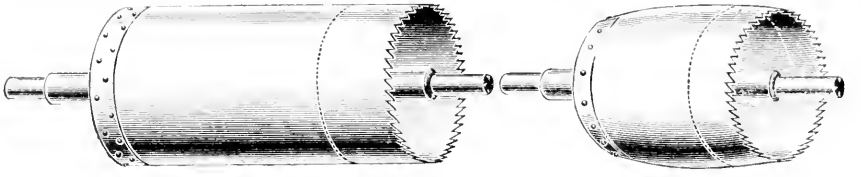
Our stock for these knives is made especially for the purpose and is the finest quality of edge-tool steel. This with our new process of tempering and grinding and the highest class of workmanship, enables us to turn out knives that for general superiority stand unequaled.

Cork Knife.

In ordering knives give diameter, gauge, size of hole, whether to be beveled on both sides or only on one, and how deep bevel is to run. If knife is a large one and screws to plate or flange send flange to us or an accurate tracing of holes, stating whether one or both sides are to be beveled; if only one side, state whether screw holes are to be countersunk or flat on beveled side. Circular and straight knives for cutting rubber, cork, etc., made to order.

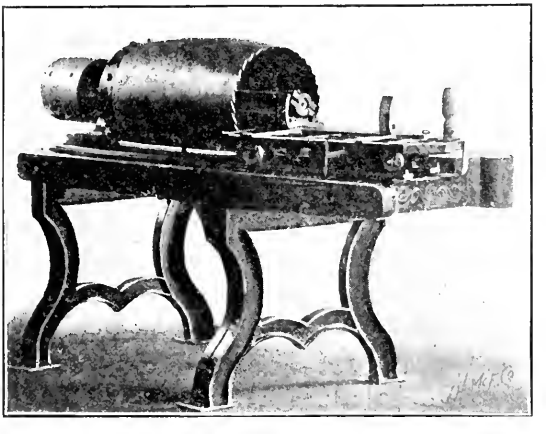
CYLINDER OR BARREL SAWS.

Stave Saw. Bilge Saw.



We are prepared to furnish these saws of a superior quality, ground and tempered by our special process. They are made of the best crucible steel and will give satisfaction. Old Cylinder or Barrel Saws resteeled and repaired.

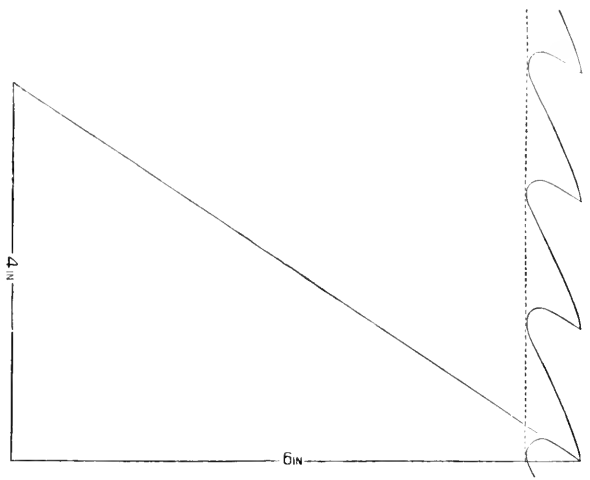
COMPLETE BILGING STAVE MACHINE.



For nail keg staves, 15″ to 20″ long. This machine is fitted with steel journals, steel carriage stops and spring in carriage.

RE-FILING CYLINDER AND BILGE SAWS.

The instructions and sketch below give a correct rule for filing and keeping this class of saws in proper order. While $\frac{9}{16}''$ is given as the base for depth of teeth, this is subject to variation to suit the different conditions.



To Obtain the Correct Depth of Teeth: See that all the points of old teeth are even, if not, raze off until they form an even edge. Chalk the surface of the saw to retain a pencil mark, on which scribe a line $\frac{9}{16}''$ from end of razed points, per dotted line on sketch.

Proper Pitch for Front of Teeth: Draw a line 6" lengthwise with axis of saw; from the end of this step off 4" parallel with edge of saw, then draw a line from this point to point of tooth and this will give the angle or pitch.

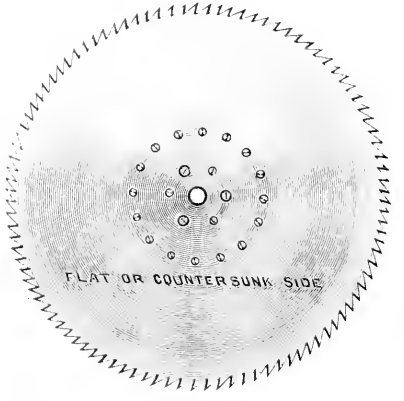
It is only necessary to lay out one tooth in the manner suggested, after which a tin templet can be cut to correspond with same and the balance of the teeth marked out accordingly.

To Shape the Teeth and Gullets a $\frac{3}{8}''$ Round File is generally used, the balance of the tooth being finished with an ordinary Mill File, shaping the front and back of tooth as shown on sketch. Particular attention should be given to file the gullets round at bottom, for sharp, square corners will cause breakage.

When dressing the teeth, file the cutting edge square with the face or front of tooth. The set should be sufficient to just clear the saw and extend no more than one-third the depth of tooth. A uniform set can be obtained by using a tin or metal templet and springing each tooth to same.

SHINGLE SAWS.

Left-Hand.



Right-Hand.

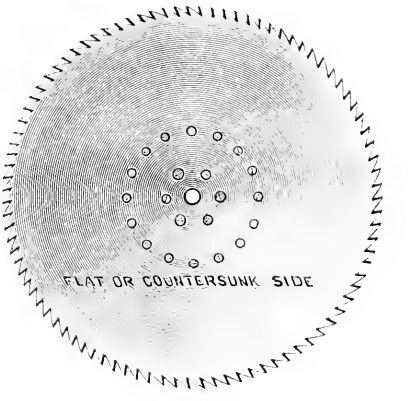


Fig. 1

When ordering Shingle Saws, give the following directions plainly. Diameter in inches; thickness or gauge, at centre; thickness or gauge at rim; diameter of flange. Send a full size sketch or pattern of holes, and samples of screw by which to drill and countersink saw. If you have a flange, send it to have holes drilled in saw to fit it. If you wish us to furnish a new flange, send full and correct sketch of diameter, thickness, holes, etc. State whose make of machine the saw is to run upon, number of teeth, flat or countersunk side (right or left hand) and mark on countersunk side of sketch the direction in which the teeth run. (See cut above).

Fig. 2

SCREWS FOR SHINGLE SAWS.

Particular attention is called to the importance of using screws that are suitable to the thickness of the saw; we frequently receive screws as samples by which to drill and countersink, that have heads entirely too large for the thickness of saw, and which require the flange to be countersunk (as shown in Fig. 1) thereby reducing the length of thread in flange, making it impossible to bind the saw firmly to flange.

Fig. 2 shows the correct size the screw heads should be, thus getting a good bearing for the screw heads on countersink in saw and the full thickness of flange is retained for thread.

In no case should the screw heads be deeper than thickness of saw. Thin saws require smaller screw heads than thick saws.

SET GAUGE FOR SHINGLE, VENEER, AND HEADING SAWS.

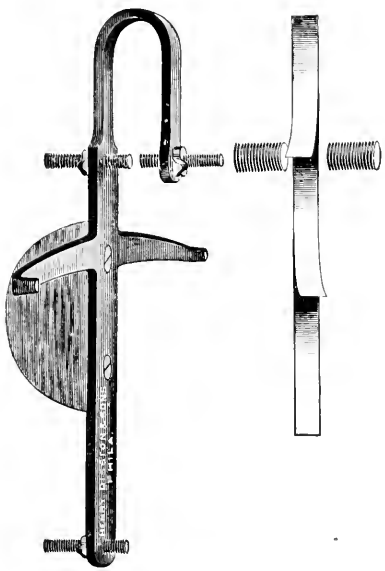


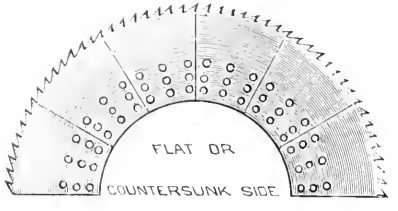
ILLUSTRATION ONE-HALF ACTUAL SIZE.

The above cut represents gauge for regulating amount of set put in shingle, heading and jointer saws.

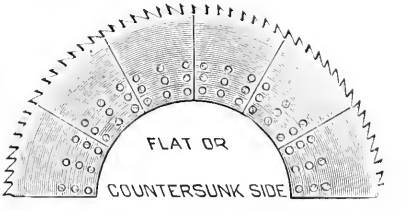
As shown, the gauge is a simple contrivance, having three set screws and two projecting arms, and is operated from flat side of saw.

The amount of set required being known, it is an easy matter to adjust; thus—First adjust gauge to flat side of saw by use of bottom screw and side arms, then turn upper screw on left hand side until it rests lightly on side of tooth near point, then reverse screw until half the amount of set wanted is shown between end of screw and tooth; fasten in this position by the jam on screw, then adjust right side of gauge in same manner, and tool is ready for use.

VENEERING SAWS IN SEGMENTS.



Left-Hand.

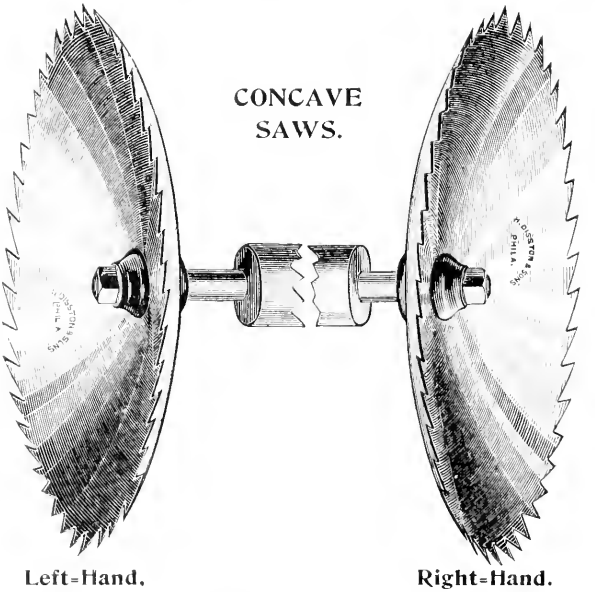


Right-Hand.

When ordering segments, give gauge or thickness at butt and at tooth edge, depth of bevel, diameter of saw that segments are to form, number of segments in saw, depth of segments, number of teeth in each segment, sample of screw by which to drill and countersink, flat or countersunk side, and direction in which teeth run (see engraving).

In ordering for a flange that has been drilled, send a sheet iron or tin templet, or a correct tracing showing holes and other particulars; or one of the old segments, giving the depth they were originally.

CONCAVE SAWS.



Left-Hand. **Right-Hand.**

The attention of the manufacturers of chair or wheelwright lumber, barrels, etc., is respectfully called to concave saws, of which we are manufacturing large numbers. They are dished and tempered by an entirely new and patented process, and guaranteed to be of superior quality in every respect. To keep concave saws in order, set both sides of the teeth alike; file the front of teeth square and bevel the back of each a trifle. Keep the same amount of rake on the fronts of all the teeth; do not run a dull saw, and keep the gullets round.

Patent Circular Mitre Saws.

CIRCULAR MITRE SAWS.

These saws are ground to run without set; especially adapted for smooth cutting, such as Cabinet and Cigar box work.

When ordering, give size of centre hole, also diameter of collars on mandrel.

CIRCULAR MITRE SAW WITH CLEANER TOOTH.

This style of saw can be made for either ripping or cross cutting. When made for ripping a greater number of cleaner teeth are put in than for cross cutting. It will cut equally as smooth in either ripping or cross cutting.

HACK SAWS.

Circular Milling Saws, Metal Saws, Hot Saws and Friction Discs.

In applying the word "Saws" most persons would presume it to be an implement for cutting lumber or wood, while such is the chief use to which they are put, they are, at the same time, used in nearly all forms for sawing metals under different conditions.

The Hand Hacksaw is a narrow blade 6 to 14 inches in length, with fine teeth. For use, these blades are strained in an iron frame. The frames are made in different styles, including the "Extension Frame," which can be adjusted to suit different lengths of blades, and are so arranged that the blade can easily be removed and another replaced in a short space of time. The steel in these saws is of the very best grade, tempered by an improved process insuring strength and hardness. For cutting the teeth and putting them in order intricate and expensive machinery has been built and by this method the work is done with greater accuracy and at much less cost than would be possible if done by hand. The saws are now made so much cheaper than formerly and being better in quality and workmanship they have come into general use by workmen of all trades and are so inexpensive that when worn dull are replaced with new blades.

The amount of work that can be done with one of these little tools is marvelous, though considerable depends upon the manner in which it is used. To cut steel that has not been properly annealed makes hard work for the saw; too heavy a pressure or a sudden thrust into the work will be detrimental to the life of the saw.

These saws are also made in large sizes for special purposes, such as making an occasional large cut, in which case the blades are made somewhat thicker and wider than ordinarily, the lengths running up to 26 inches, and are fitted to frames similar to a Butcher Saw. See illustrations on page 153.

Metal saws are also made in the form of the regular carpenters' handsaws, and also similar in shape to the Back or Tenon Saws. These are made of a special steel and temper, are ground thin towards the back and can be re-sharpened with a good file. The Tenon saws of this style are principally used in mitre-boxes in the manufacture of show cases, etc., while the hand metal saws are for purposes where other forms of hacksaws cannot conveniently be used. Large saws in the form of handsaws are also made and can be operated by two men the same as cross-cut saws, the handle for small end of saw is adjustable and can be attached or detached at will. These are principally used in brass foundries for sawing the gates from large castings.

Portable Hand Machines are now made and are supplied with a wider, much thicker and somewhat longer blade. They are used in railroad construction and repairs, the rail being clamped in the machine while the saw can be adjusted to cut either straight or diagonal. This is a great improvement over the hammer and chisel formerly used for this work, and while the machines are adapted for hand they are also arranged to work by power.

CIRCULAR SAWS OR DISCS FOR CUTTING HOT OR COLD IRON OR STEEL.

For fast cutting of cold steel or iron, friction-discs, are used. For hot steel and iron, saws having teeth varying from $\frac{3}{8}$ to $\frac{7}{8}$ inches in space, are used, the angle of teeth being equally divided from a line drawn from points of teeth to centre of saw, and are run at a speed lower than friction-discs. These saws and discs are made of mild steel manufactured expressly for the purpose.

To give the best results, these saws and discs must be run at a high and uniform rate of speed. Hot saws should be run at about the rate of twenty thousand feet per minute (rim motion). Discs for cutting cold iron or steel should be run about twenty-four thousand feet per minute (rim motion) and it is highly important that the mandrel and collars upon which they run should be amply heavy, large and true, and so secured in boxes to the frame work or housing to avoid all vibration. The arbor should fit the centre hole of the saw neatly, this is necessary for good work.

In cases where the motion of these saws is reduced from any cause, the feed should be reduced proportionately, or work should be suspended altogether until proper speed can be regained. The work in no case should be forced suddenly upon nor crowded on the saw.

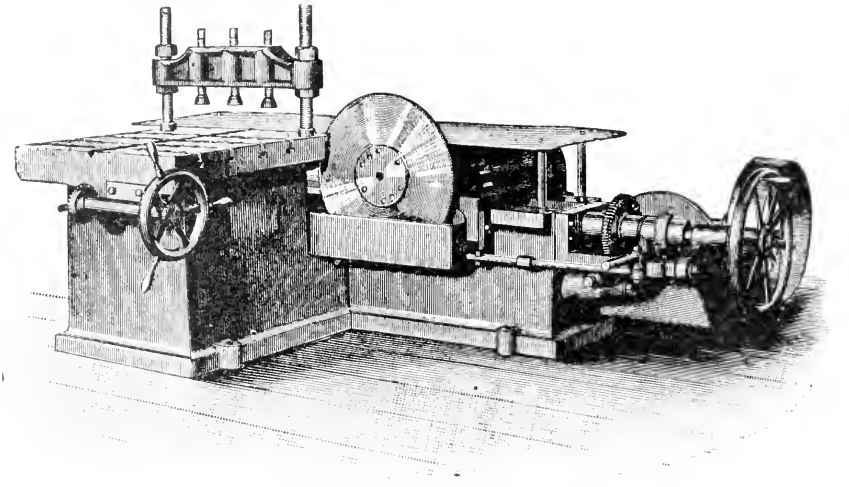
The flanging which takes place upon the rims of discs should be removed frequently and before it becomes ragged, or cracks in the plate will be the result.

Hot iron saws should be kept sharp, otherwise they will jam in their work, and be liable to break.

For slow motion or milling saws for cutting steel rails, beams etc., the saw should run 45 ft., rim motion, per minute with a feed of $\frac{3}{4}$ inch per minute. This amount of feed is for a 28 inch saw with 200 teeth of about $\frac{7}{16}$ pitch or space. While the rim speed of saw, i. e., 45 ft. per minute should be maintained for any diameter, the feed must be reduced to correspond to a less number of teeth; also for deep cuts the feed should be slowed down to prevent jamming of the chips in the gullet, it is best to have a wire brush rigged over the saw for the purpose of knocking the chips from between the teeth so they will not be carried around in the cut again. This brush need not have any motion, only such as it gets from coming in contact with the saw. For wrought iron the speed can be increased to 60 ft., rim motion, and feed to 1 inch per minute. There should always be two or more teeth in the cut at the same time. For rails and beams, $\frac{7}{16}$ space is considered right in the solid saws. For the large saws, for special purposes, with inserted teeth, the space varies from 1 inch to $3\frac{3}{4}$ inch. If the work be fed to the saw below the centre line the saw should run from the operator; or if the work is fed above the centre line the saw should run toward the operator. This will prevent the work from being pulled in on the saw from any lost motion that may occur and prevent the teeth or saw from being broken. For Brass or soft metals, the speed can be increased to about five times that of iron saws. For metal tubing, fine teeth must be used; speed and feed in accordance with metals, as given above.

In ordering any of these saws, the purpose for which they are to be used should be given.

Cold Saw Cutting off Machine.



The above is an illustration of No. 2 Machine for cutting bars round or square up to 5½" and beams 6" x 24". This machine carries a 24" saw, weighs about 7500 lbs., and is made in six sizes.

Each machine is complete with one saw, cover plate, clamping device, saw grinding machine and counter shafts for machine and grinder if desired.

This machine by means of a large milling cutter or saw will cut off any shape stock, perfectly square or at any angle to exact lengths.

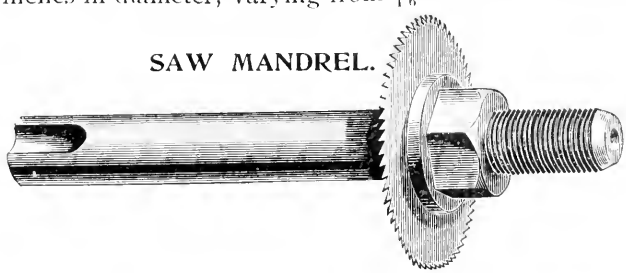
Illustrated pamphlets with description, prices, etc., sent on application.

Size of machine.	To cut bars. Round or Square.	Beams.	Diameter of Saw.	Weight about.	Diameter of tight and loose pulleys.	Speed of counter shaft.
0	2½	2½x10	12½	2,500	12 inches.	350
1	4	4½x16	18¾	4,500	14 "	300
2	5½	6x24	24	7,500	20 "	250
3	7	32x 8	30	9,500	20 "	400
4	9½	12x38	36	13,000	24 "	450
5	12	15x56	48	20,000	26 "	500

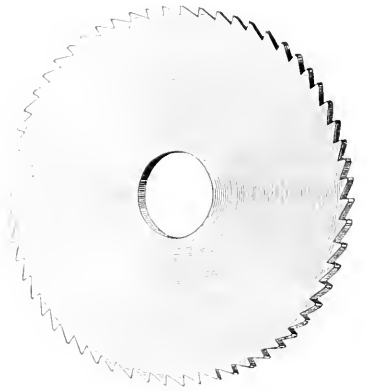
INSERTED TOOTH MILLING SAWS.

The above cut represents Inserted Tooth Milling Saws, used for sawing heavy beams, girders, armor plates, etc. We make these from 18 to 84 inches in diameter, varying from $\frac{5}{16}$ to 1 inch in thickness.

SAW MANDREL.



For saws and emery wheels to be used in the lathe, made of steel with hardened ends.

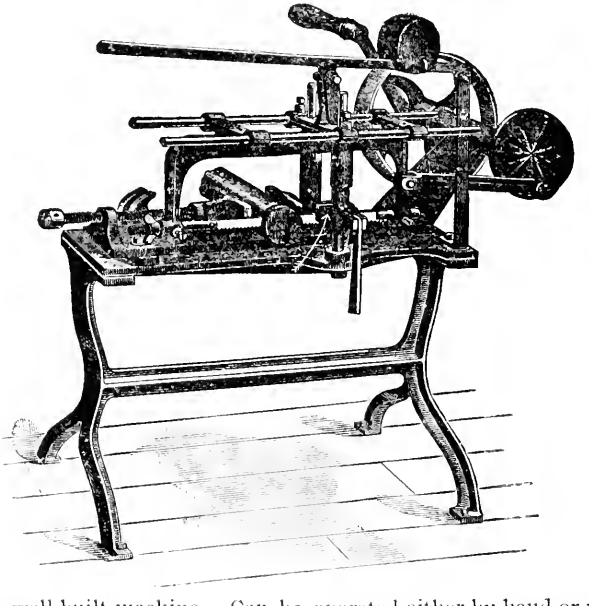


MILLING SAW.

SLITTING SAW.

We make Milling saws and saws for cutting metal at either high or low rates of speed, of any diameter up to sixty inches, and of any thickness required. These saws are hardened by a new and improved process, and made of a quality of steel that exactly suits the purpose for which they are used.

DISSTON'S METAL SAWING MACHINE.



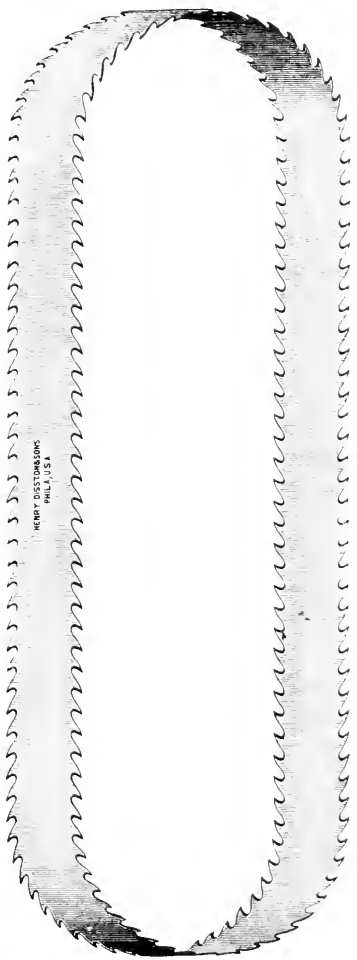
A strong, well built machine. Can be operated either by hand or power. Will cut all shapes and sizes up to four inch round, and at any desired angle.

The guide (see arrow) keeps the blade straight, prevents chattertering, and its weight on saw will hold it down to work when starting the cut. To compensate for different thicknesses of blades the cap of guide should be packed with thin pieces of steel.

SUGGESTIONS and INSTRUCTIONS

AS TO CARE AND MANAGEMENT OF

BAND SAWS



SINGLE and DOUBLE EDGE.

DISSTON'S NEW PROCESS STEEL.

Of all the metallic alloys, steel is at once the most important and the most easily produced. Its malleability, ductility and plasticity when heated, rendering it easy to fashion to any required shape. While its strength, hardness, elasticity and tenacity when cold, give it a superiority over all other metallic substances. But this highly useful substance, even in its most carefully made and most expensive qualities, was not without defects, and these defects were of the most serious character; the more so as they generally defied detection in the production and manufacture of the steel itself, and developed only in the finished article, often when in use, frequently at the most inopportune moment, and always causing serious inconvenience and loss to all concerned. These defects arise from what are called Blow-holes, Spongyness or Honeycombing, all of which are formed in the interior of the original ingot at the time of casting, and from the nature of their position are generally undetectable. To overcome these defects and produce solid ingots has been the aim of every steel maker from the time of Tubal Cain to the present day. But all attempts had been equally unsuccessful until the introduction of the "**Rich Alloys.**" **By the addition of a small quantity of this alloy to the molten steel in a particular manner, known only to a few,** if properly applied, the steel ingots are rendered at once sound and completely freed from Blow-holes, Spongyness and Honeycombing, thus freeing the steel from those great defects which had so long detracted from its usefulness and increased its cost. Not only are sound ingots produced by the "Disston New Process," but the steel itself is materially benefitted thereby; its strength, its tenacity and its durability being at the same time largely increased.

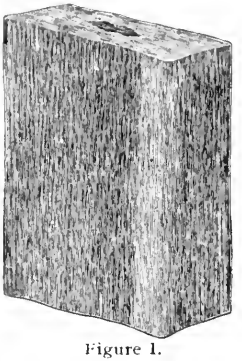


Figure 1.

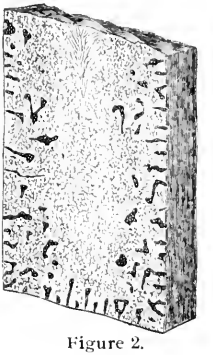


Figure 2.

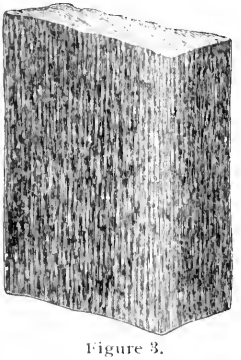


Figure 3.

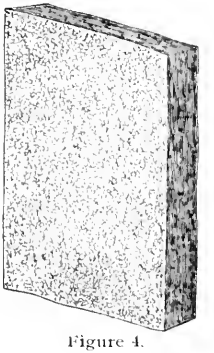


Figure 4.

We were among the first to avail ourselves of this process for the manufacture of steel for saws and files, and to this fact is largely due the success and celebrity of the "Disston" world-renowned tools.

The accompanying illustrations Nos. 1 and 2 show the exterior and interior of a steel ingot produced by the ordinary method. Illustrations Nos. 3 and 4, exterior and interior of a steel ingot produced by Henry Disston & Sons' "New Process." It will be seen that while the exterior of both ingots are apparently the same, the interior is so markedly different as to need no further comment.

THE BAND SAW.

The life of a band saw depends *very* largely on the way it is handled, particularly when it is new and before it has been perfectly adapted to the wheels on which it is run. Many men expect a new saw to do more work than one that has been perfectly adapted and adjusted to the wheels and the alignment of the mill. This is a mistake, for there are peculiarities about every mill, and until a new saw is adjusted to the face of the wheels, *their aligning or tilt*, the speed and feed, they cannot be expected to give as good results as the older saw. There is a certain quality about a new band saw which we can best describe by calling surplus elasticity, and until this quality is brought down to its proper bearing by the judicious use of the hammer and saw stretcher in connection with the first "runs" of the saw, it will not be at its best. The manufacturer is not in a position to subject the saws he sends out to the same strains they receive in the mills, hence a saw will change more on the first run than on any succeeding one, and should be gone over with extra care the first time it comes off; in fact, if the system of running a saw only half an hour on its first run, then taking it off and touching it up wherever necessary, was more generally followed, there would be fewer cracked blades, and the life of all saws would be increased. All experienced filers and mill men know that excessive speed, too much tension, uneven tension, case-hardening or glazing from the emery wheel, gum adhering to face of wheels, crystalization from too heavy hammering, cuts on the surface of saw from sharp faced hammers, vibration of either machine or saw, sharp angles in the gullets, imperfectly adjusted guides, backs of saws too long or too short and excessively cross aligned to make them "track," insufficient throat room and hook, crowding the saw against guard wheel, will cause it to crack. These are all well-known causes of breakage, yet notwithstanding the knowledge that all band saws are more or less subject to these conditions, too often the cause of fracture is attributed to the quality of the steel or over hardness. In justice to the saw manufacturer, due consideration should be given the fact, that the saw is only *one* item, while each and every one of the above named causes is a large factor in producing cracks in band saws. If a saw will stand swaging, and the swage can be side compressed without spalling, it is very good evidence that the temper is not too high.

We receive many letters from Band Mill owners and operators asking our advice as to the best manner to fit, tension and operate the saws to attain the best results in capacity and quality of the lumber made and at the same time get the most wear out of the saws. It is impossible to lay down a set of rules to fit all cases, or answer correctly any single one without knowing all the conditions under which the saws are run,

but we will give a few of the most important points in reference to the care and management of the band saw which, if followed out carefully, will benefit those who have heretofore neglected any of these points.

We will assume that you have a good modern mill, one from a first-class builder who has learned from experience to so proportion and distribute the metal in his machine that the saw can be strained up to the proper point without springing or distorting any part of the machine and have an ample margin of strength to properly stand the additional strain put on it by vibration. Such a mill is the only one from which the highest results can reasonably be expected.

Vibration is one of the greatest causes of bad results in the use of band saws and, knowing this, particular attention should be given to the wheels and their shafts, the journals and boxes; the wheels must be round and in perfect balance and the shafts must run free in their boxes with no lost motion. Sawyers occasionally complain that their saws which have been doing good work and giving satisfaction, commence to crack. This fact is not so surprising when we consider the immense tensile strain the saw is subjected to whilst running and the number of times in a day that the saw is bent and straightened in running over the wheels, all of which, eventually, causes crystalization of the steel and cracks the saw.

None of the leading Band Mill builders are making as much crown to their wheels as they were a few years back, and some of them are making flat wheels, each style has its advocates and will give good results when properly handled, but as some of the best mill builders give one 64th of an inch crown in a 12 inch face wheel, it seems a question of education or preference with the operators.

Common philosophy shows that the least amount of crown, the less tension necessary in the saws; which in turn means less hammering and rolling, flatter saws, less kerf, and less tendency to crack.

Perfectly uniform tension is the next important point, for if a saw has fast and loose spots in it, the tendency to crack is largely increased, the fast spot cracking from undue tensile strain and the loose spot from constant buckling of surplus metal.

The tools required for hammering Band Saws will be a Cross Face Hammer, a round or Dog Head Hammer and a Twist Face Hammer, each weighing about 3½ pounds (see page 110, of complete outfit). The Anvil should have a flat face and be perfectly true. Strike light fair blows, using care not to cut or mark the surface of the saw by the hammer, as cracks are apt to start from such marks, particularly when occurring near the edges.

To experiment, cut a piece three feet long from a worn out or broken band saw, lay it on the anvil, taking your position at *H* in

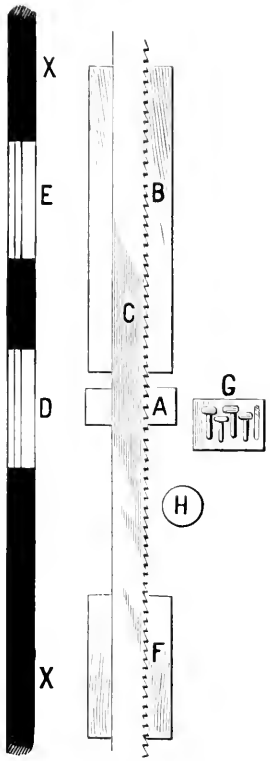


Fig. 1.—(Cut showing proper position of Anvil, Levelling Table, Table for hammers and position of operator at work.

figure 1. Commencing at the end of the piece furthest from you place the straight-edge square across the blade and holding the blade with the left hand cause it to bend or curve as shown in figure 2. The places drawn to the straight-edge, as in figure 3, are "Fast" and those places that drop from the straight-edge are "Loose." The first object is to make the saw "Flat," or stiff as shown in figure 4, after having knocked down all the lumps. Having located a "fast" place you will notice that it shows on both sides of the blade similar to the manner in which a lump shows when the saw is lying flat. Remove the "fast" by use of the round hammer, working on both sides of the blade, and trying frequently with the short straight-edge. Be careful at all times to keep the edges true. Now take out the "loose" by use of the same hammer until you have the piece stiff or flat throughout. Then proceed to locate and remove the "twists" still working from both sides of the blade and using the cross-faced hammer.

Now proceed to open or tension the saw until it shows the required amount of drop from the straight-edge, figure 5, usually about a sixteenth of an inch in a ten inch saw. The greatest opening should be done in the centre of the blade, decreasing gradually to within about an inch from the tooth edge and about one half inch from the back edge, varying a little according to the work to be performed. Be careful not to get the saw too open and examine from time to time with the small straight-edge. To insure the saw travelling on the wheels without any lateral motion, and to keep the vibration of slack side of saw down to lowest point, the tension must be perfectly uniform throughout the entire blade.

The proper amount of tension varies according to the feed of the mill and crown of the wheel, but $\frac{1}{16}$ or $\frac{3}{32}$ of an inch is about the average used, under no circumstances do we think it judicious from any point of view to put in so much tension that the saw will not lie flat from its own weight on the levelling table. The use of a tension gauge (see cut page 101) with one edge curved to the amount of tension wanted will be found of great service in adjusting and putting tension in saws. Place the saw on anvil as in hammering, hold the tension gauge square across

the blade at arms length as in figure 2, and if the tension has been properly adjusted the saw will conform to the curved edge of the tension gauge from tooth edge to back. To reduce the amount of tension or

FIG. 2.

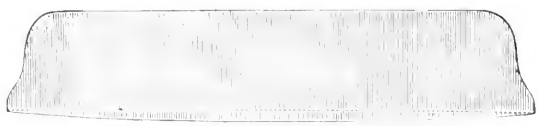
stiffen the blade, hammer gently along the edges of the saw (both sides) taking care not to strike nearer than a quarter of an inch from the edge or bottom of a tooth, figure 7. To increase the tension (or "open

FIG. 3.

up") hammer the centre or body of blade, testing frequently with the tension gauge, figure 8.

The matter of feed is a very important item in the successful run-

ning and life of a Band Saw. The good sawyer is one who will get all the lumber out of a log there is in it, at a rate of speed up to the capacity of the mill and not strain the machine or saw in so doing.



TENSION GAUGE.

Made in lengths from six to twelve inches, with curved edge adapted to face of the wheels and the tension required.

Do not have sharp gullets to the teeth; this concentrates the bend of the saw as it runs over the wheels too much at one point. Use a long round gullet, as large as practicable, with no sharp corners or abrupt angles. Teeth that are too long chatter in the cut and sometimes cause fractures by throwing undue strain on the blade at the root of the tooth.

The swaging and fitting of the teeth is practically the same as in a full swaged gang saw, the swaging being side filed or shaped to a uniform width with an under cut in order to leave the extreme point of tooth a trifle the widest, the full amount of swage when side filed

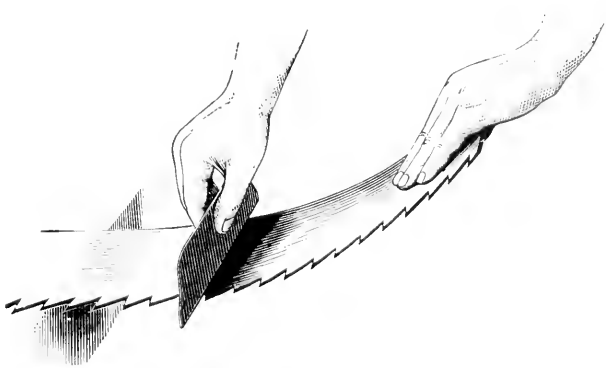


FIG. 4.

should never exceed No. 9 gauge in a 14 gauge saw and in hard timber can be run with less clearance; it is advisable to run with as little swage as practicable for it decreases tensile strain on the saw as well as saving lumber in the kerf and requiring less power. The amount of hook ranges from four inches to six and one-half inches in a ten inch saw,

being governed by the timber to be sawn and the amount of feed carried; when a properly hammered saw runs perfectly true on the wheels out of the cut, but "chases" back on the wheels as soon as it enters the log, increase the amount of hook until saw retains practically the same position on wheels both in and out of the cut.

In sharpening use a medium soft emery wheel and do not crowd it

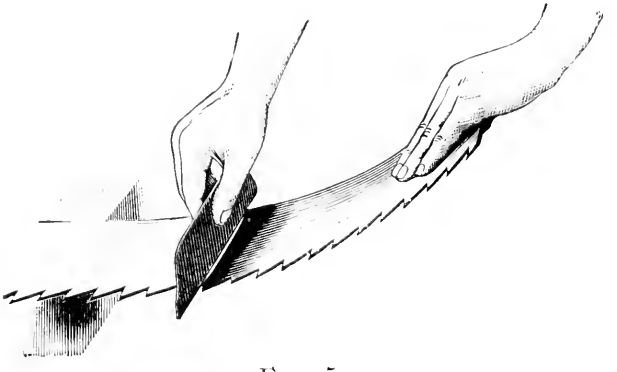


FIG. 5.

on its work as this would result in case-hardening the gullets. Cracks are liable to start from any of these case-hardened spots.

Never let the back edge of saw come in contact with back guard wheel or any other hard surface, as case-hardening is bound to ensue from which cracks will surely result. Should the saw be accidentally forced against the guard and case-hardened, remove the glaze at once by

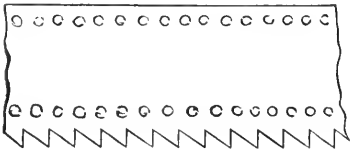


FIG. 7.

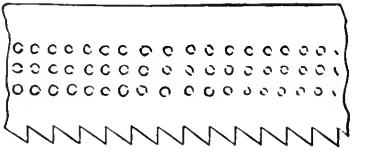


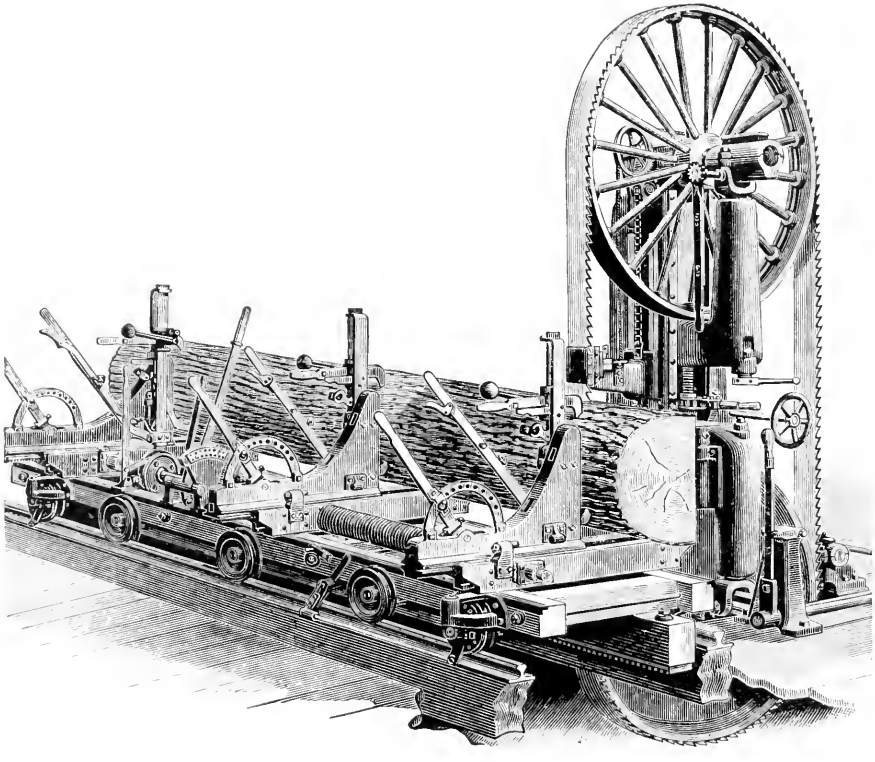
FIG. 8.

holding a piece of soft emery wheel against back edge while saw is running slowly. Do not take it for granted that the back edge of the saw has not been in contact with the guard wheel, try a file on the edge of the saw frequently as it has only to make one revolution with the back edge against the guard to do the case-hardening, and is done so quickly, that it often happens without the knowledge of the operator.

It is essential to have toothed edge of saw tighter than any other part and to accomplish this without materially affecting the uniformity

of tension, roll the saw a little longer on the back edge. Let the increased length begin at the point in saw where greatest tension shows and let the back edge show about $\frac{1}{32}$ of an inch rounding in every five feet then tilt upper wheel forward enough to make saw have as strong a pressure on wheel at back edge as at front; this will leave that part of saw between wheels with a tight toothed edge without subjecting it to that undue strain brought about by making tooth edge tightest by an *all tilt* movement The guides should be lined with either soft Babbit metal or hard end wood and adjusted as closely to the side of saw as possible without heating the blade by friction against the metal or wood. The side of saw must be in perfect alignment with the *V* track and guides adjusted to saw, under no circumstances should the saw be deflected by guides, but have free, small and equal clearance on both sides. The tensile strain should be only sufficient to prevent slipping of saw on lower wheel, the highest capacity and best mills now rarely exceed a strain of 5000 lbs., which is all sufficient if saw and mill is in proper condition, while no amount of strain will make an irregularly tensioned saw or a poorly aligned mill make good lumber, but will instead bring more strain on every part of the mill and cause the saw to crack much sooner. The majority of the large mills are now using the Roller or Stretching machine for putting in the tension. The desired effect can be attained in a shorter time and with less injury to the saw than if the tension be put in by hammer. It is necessary, however, to use the hammer for finishing and regulating, after the use of the stretcher.

LEFT HAND BAND SAW MILL.

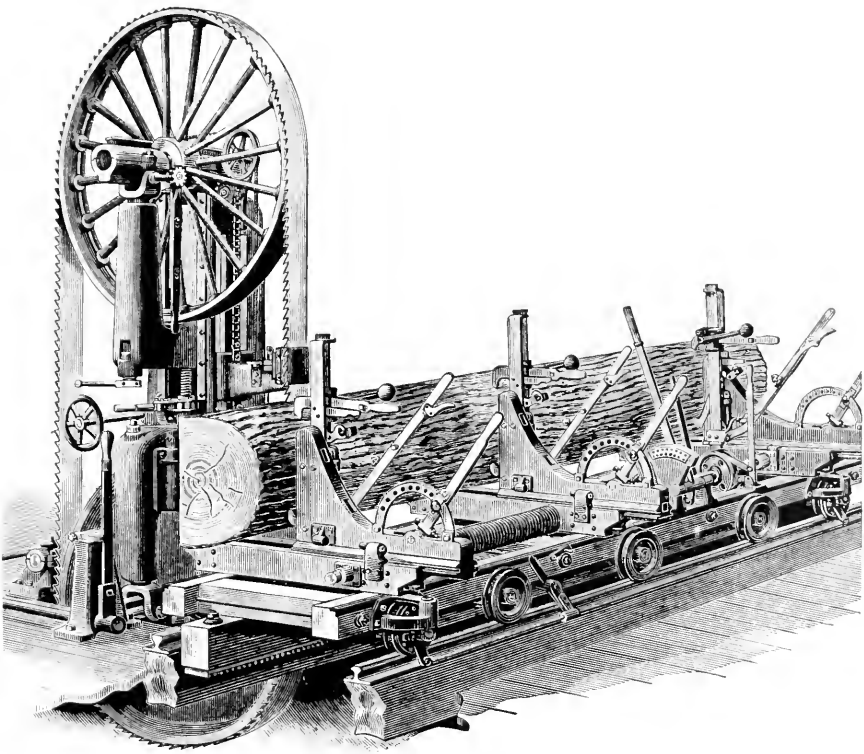


Cut No. 1.

When ordering Band Saws, be particular to state whether Right or Left Hand Saws are desired; also give full particulars as to gauge, style of tooth, back edge, etc. If the saws are to be crowning on back we finish them $\frac{1}{32}''$ crowning to each 5 feet in length, unless otherwise instructed.

We will supply, on application, an order blank giving details to be

RIGHT HAND BAND SAW MILL.

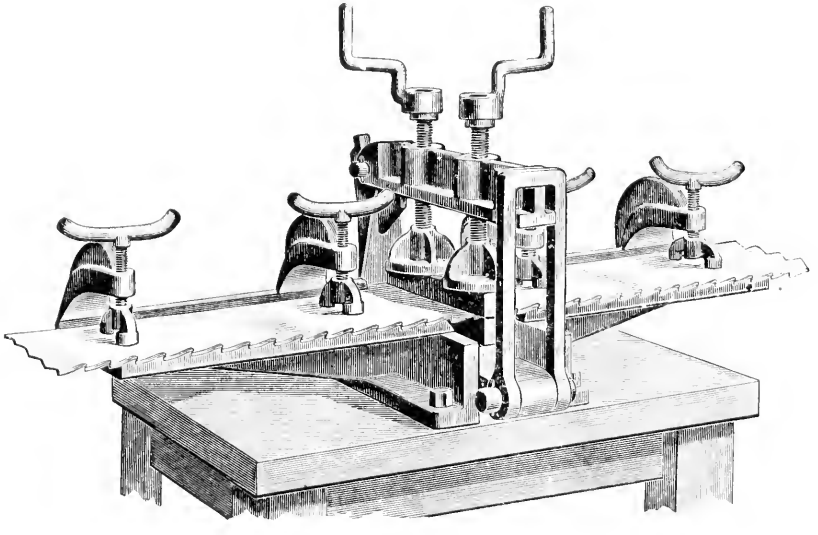


Cut No. 2.

specified, and if this is properly filled out it will enable us to make up the saws exactly as required.

The above illustration, together with the one on preceding page, give views of two mills, by which the "hand" of saw can readily be determined, *i. e.*, cut No. 1 shows design of a Left Hand Mill, the log being on the left side of saw when standing facing the mill, whilst cut No. 2 shows Right Hand Mill, the log being on the right hand side of saw.

HENRY DISSTON & SONS' METHOD OF BRAZING BAND SAWS.



We attach herewith cut of brazing clamp for the purpose of reference; this pattern we have in use at our factory.

The parts to be joined should be beveled to a feather edge on opposite sides to a width of 5/8 inches to a very nice fit; the ends of bevels should be perfectly square, and taper of bevel must be uniform throughout. Too much attention cannot be given to this point, for if the bevel is not uniform and surface of same not perfectly even, a good joint cannot be made.

Clean the beveled parts with slacked lime. We recommend

slacked lime instead of muriatic acid, as a great deal of the acid of commerce is very impure. Place the scarfed ends of saw on the brazing table with the back edges against the back of brazing clamp or whatever part serves as a straight edge, to insure having the edges of the saw perfectly parallel. Have the centre of lap directly over the centre of irons when in position. Arrange the main brazing clamps so that the saw when clamped will be in perfect contact with the body of table, so that final pressure can be applied quickly without disarranging the position of saw after the hot irons are in place. Cut a strip of Silver Solder the same size as lap and clean this in the same manner as parts to be joined, taking care to remove all traces of grease and dirt; place this between the laps. Slip the irons, which should have a good true surface, in position, one under and one over the saw, centrally and squarely across the surface of laps. After making sure the adjustment is correct remove irons and heat them to a bright red in a moderate fire, using charcoal or coke.

When the irons are at the proper heat scrape all the scale from the sides to be applied to the saw, replace them as originally adjusted and apply the pressure on the main clamps quickly, after which loosen the side clamps adjoining the braze to allow for expansion and to relieve the strain on body of saw.

As the irons cool, tighten the main clamps from time to time. Allow them to remain on the saw until they become black, then remove them. This will leave sufficient temper in the saw to hold the tension when hammered and prevent that portion of the saw just brazed from becoming too hard. Be sure the irons have always a good true surface. After using a few times they should be dressed off, which is necessary to get an even pressure.

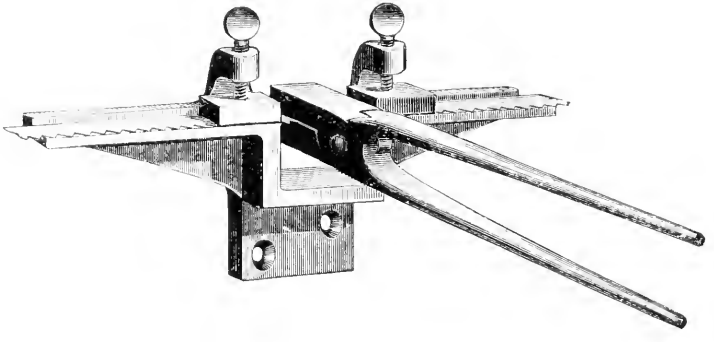
The closer the scarfed ends fit, the less solder will remain in the joint and the better it will hold. In clamping down the irons, see that they are placed square across the saw. Use nothing but Silver Solder of the very best quality as furnished by Henry Disston & Sons, and see that both solder and scarfed edges are perfectly free and clean from grease. This is absolutely necessary to make a good joint. Do not remove the irons too quickly, nor attempt to cool off the blade with water, as this is apt to make it brittle. When the braze is cool enough to handle, the joint can be cleaned, straightened,

dressed to thickness of balance of the blade and hammered and rolled to the same tension.

To those desiring to use a flux, we recommend the following:— Cover the laps with a thin borax paste to make a good flux. The borax for making the paste should be burned in a pan over a slow fire and frequently stirred to allow all the gases to escape; after burning, pulverize as fine as possible, mix with water, and apply a thin coat to silver solder and parts to be joined just prior to placing the hot irons.

By carefully following the above directions, you will be able to make a satisfactory braze.

DIRECTIONS FOR JOINING SMALL BAND SAWS.



SMALL BRAZING CLAMP AND TONGS.

The parts to be joined must be beveled to a nice fit. Secure the saw at both ends in clamps, as per cut. See that the edges are parallel, or a short and a long edge will be the result, which will cause the saw to run badly and to break on the short edge when strained. Put on the filed parts a thin coat of borax paste. Cut a piece of very thin sheet silver solder of the same size as joint to be made, which place between the lap. Take a pair of tongs having suitably sized jaws for the joint

and that have been heated to a bright red, sufficiently to melt the solder. Scrape all the scale off between the jaws with an old file; hold the joint with the hot tongs until the solder has thoroughly melted; remove the hot tongs carefully and follow up with another pair heated to show a dull red, which will set the solder and prevent the joint from being chilled too suddenly. The joint can then be dressed to thickness of the saw blade. It would be as well to have a pair of cold tongs to clamp the hot jaws firmly to the joint, as the hot iron must fit nicely over the whole width of the saw. In joining, do not make the lap longer than is absolutely necessary.

BREAKAGE OF SMALL BAND SAWS.

Among the most frequent causes of breakage the following may be named: The use of inferior saws of unsuitable gauge for the work, pulleys being out of balance or too heavy, the use of improper tension arrangements, not slackening saw after use, thus preventing the free contraction of saw blades on cooling down after work, the framing of machine column being of too light a section or too high, thus causing excessive vibration, joint in saw not being of the same thickness as the rest of the blade, improper method of receiving the back thrust of saw, consequently case-hardening the back of saw blade and cracking same, using band saws with angular instead of rounded gullets at root of teeth, top pulley overrunning saw, working dull saws, feeding up work too quickly to the saw, allowing saw dust to collect on face of saw-wheel, thus causing it to become lumpy and uneven, stopping or starting a machine too suddenly, especially while using a light blade, will almost certainly snap a saw in two.

Always endeavor to have a full knowledge of the working and condition of each saw in your charge and examine each blade carefully as it comes off the wheels. Close application in studying the conditions under which the saw works, along with good judgment as to when it is properly fitted for its particular work, is *what is wanted in every filer* who wishes his band saw to run successfully.

LIST OF MACHINES TO MAKE COMPLETE OUTFIT FOR BAND SAW FILING ROOM.

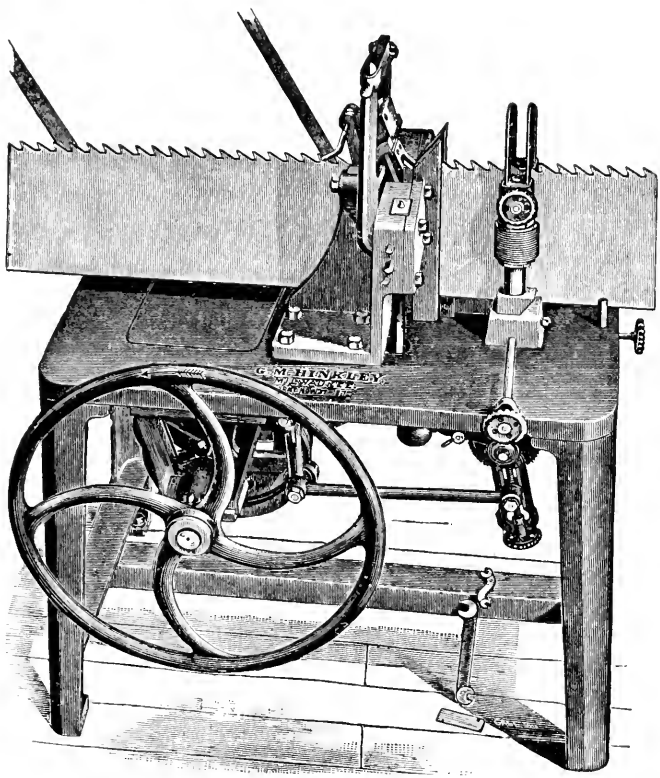
1 or 2 Automatic Sharpeners.
1 Saw Stretcher.
1 Scarfing Machine.
1 Fitting-up Clamp.
1 Set of Pulleys and Stands.
1 Brazing Clamp.
1 Re-toother and Shear.
1 Forge for Heating Brazing Irons.
1 Patch Machine.
1 Anvil.
1 Straight-edge 5 or 6 feet long.
1 Short Straight-edge.
1 Tension Gauge.
1 Back Gauge.
2 Hammers—1 Cross Pean, 1 Ball and Pean.
1 Hand Swage.
1 Swage Shaper.
1 Levelling Block.

We are prepared to furnish customers with any of the above tools and will be pleased to supply description and quote price on anything required for the keeping and fitting of saws. Correspondence solicited.

Patent Automatic Power Swage

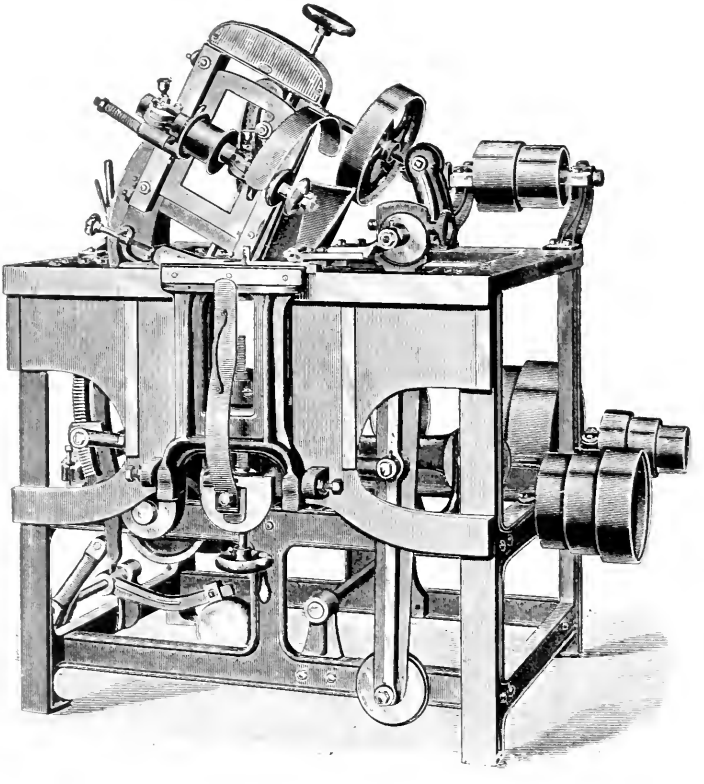
—FOR—

BAND SAWS.



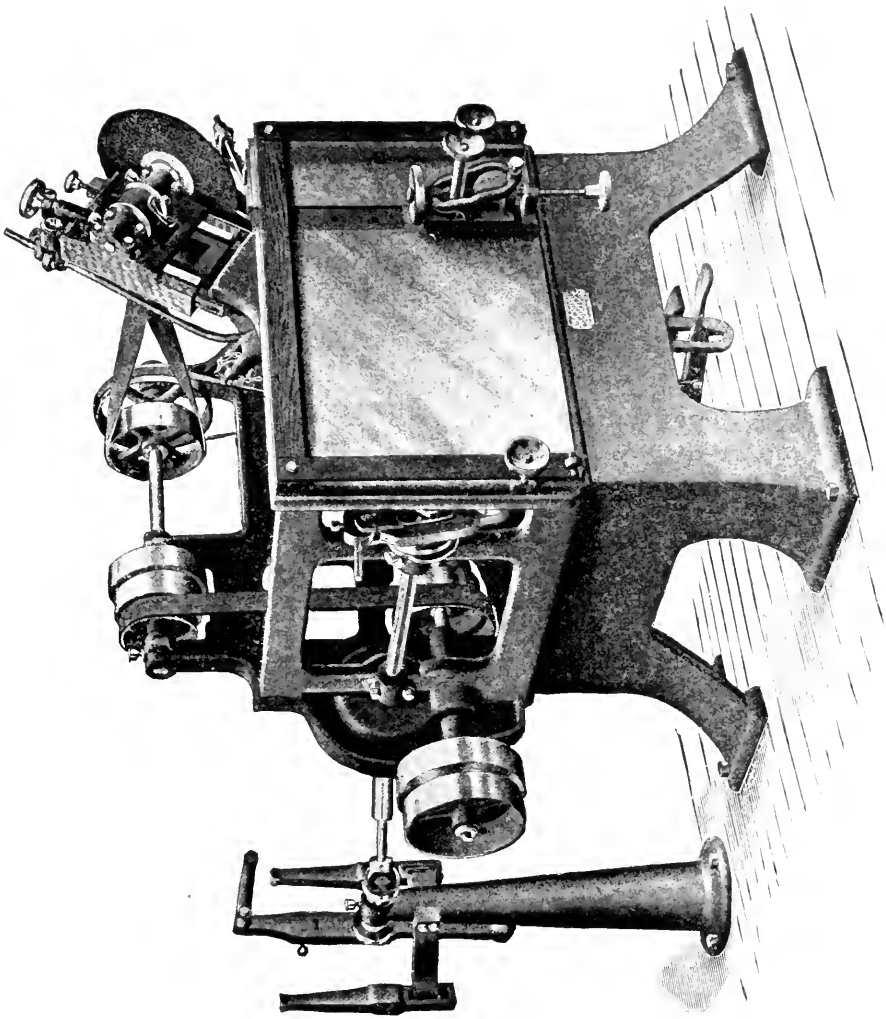
This machine operates from the under side of the tooth without changing the hook and leaves the saw in perfect joint. The machine is adjustable to hook, shape or space of teeth, leaving them in proper shape for the shapening. The machine is very carefully constructed and of the best material, and we recommend it to any one in need of a good power swage for Band saws. Prices and instructions for use on application.

AUTOMATIC BAND SAW SHARPENER.



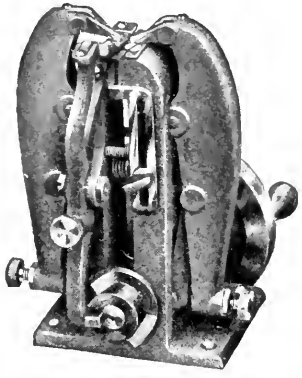
The above cut and the one on the following page illustrate up-to-date Automatic Band Saw Sharpening Machines that will sharpen band saws from 8″ to 15″ in width with any shape of teeth from 1½ to 3 inches from point to point. The heads can be set at any angle; the feed fingers are adjustable as also the feed finger stops. These machines can be used for right and left hand saws, two back feed arms being furnished for the latter purpose, also Post Brackets for carrying the saw.

AUTOMATIC BAND SAW SHARPENER.



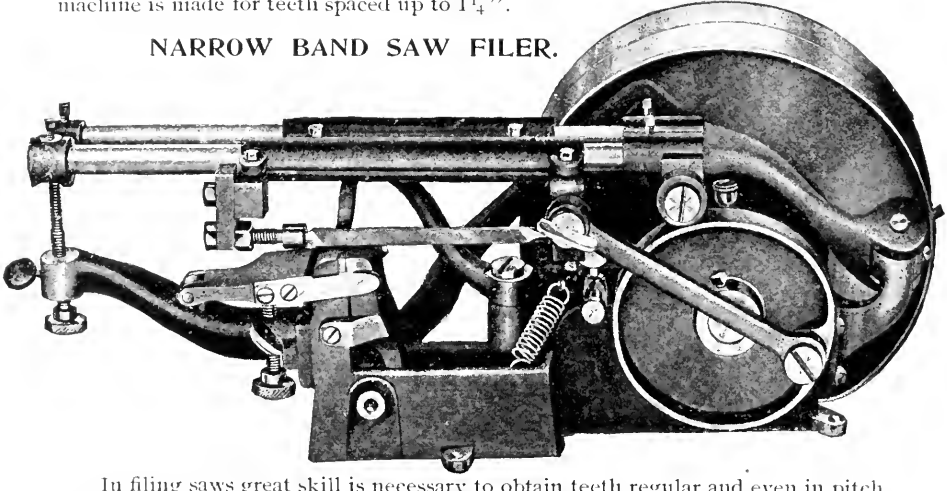
For large band saws. Cuts, descriptions and prices for band re-saw sharpeners will be furnished on application.

AUTOMATIC HAND BAND SAW SETTER.



To obtain a true and uniform set the Automatic Band Saw Setters are unexcelled as every tooth is bound to be treated alike, and in sawing each tooth will perform its proportionate part of the cutting with the least possible strain on any part of the saw. With the saw properly adjusted to the above machine one revolution of the crank feeds and sets two teeth, one to the right, the other to the left. All the movements are automatic and rapid, the machine giving its blow in such a manner as to properly set the teeth, while the force of the blow can be instantly regulated by a thumbscrew, thus permitting the setting of light and heavy blades. These Setters are adapted for saws with teeth spaced from $\frac{1}{8}''$ to $\frac{5}{8}''$, and a special machine is made for teeth spaced up to $1\frac{1}{4}''$.

NARROW BAND SAW FILER.

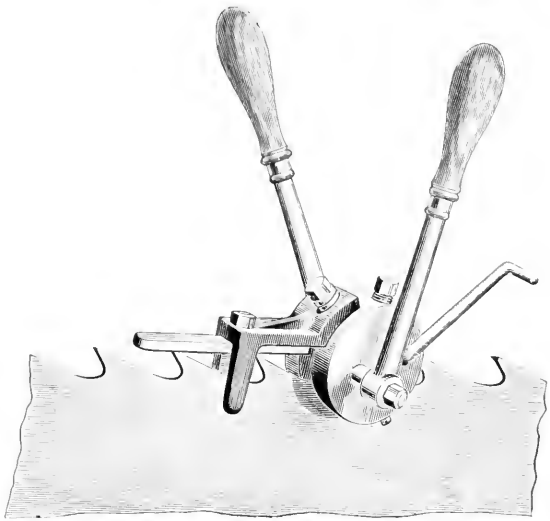


In filing saws great skill is necessary to obtain teeth regular and even in pitch and shape, for with the cutting points out of line or bevel a saw cannot run straight or smooth. With a successful automatic filer the work can be done in less time and with greater accuracy than by hand, and if the saw is uniform in shape a simple light filing or setting from time to time is all that is required to keep it perfectly sharp and properly set.

The above machine is built to run by power and will file 50 or more teeth per minute, using an ordinary 6″ or 7″ band saw file which can be adjusted so as to afford more or less hook, filing each tooth separately or alternately as desired. A small size is made for filing teeth spaces from $\frac{1}{16}''$ to $\frac{5}{8}''$ and a larger size to take in $\frac{1}{16}''$ to $\frac{3}{4}''$.

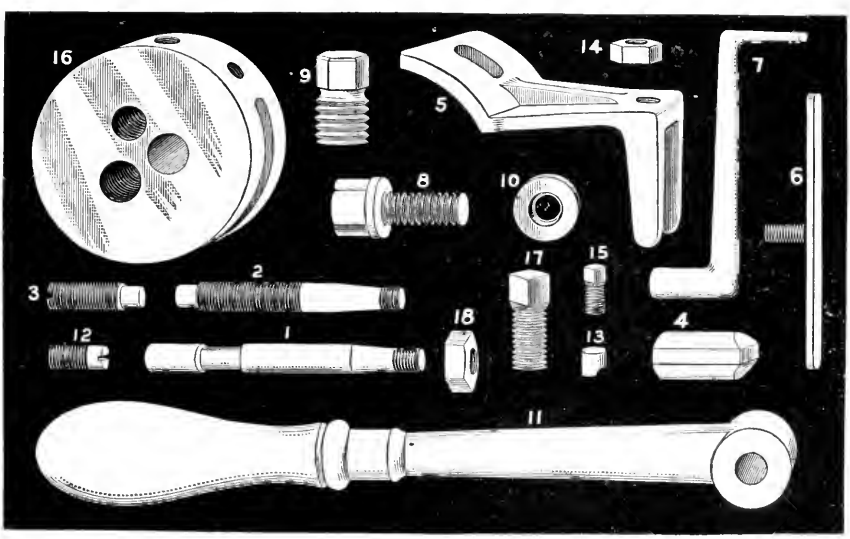
In using automatic machines on saws previously filed by hand it is best to go over the saw several times with the machine until the teeth become regular, and care should be exercised in brazing to maintain uniform spacing as the machine will not correct uneven spacing.

DISSTON ECCENTRIC BAND SAW SWAGES



Made in two sizes. The No. 1 is adapted to saws from No. 12 to No. 16 gauge in thickness, the No. 2 will swage saws from No. 16 to No. 21 gauge. When ordering give thickness of saws the swage is to be used on and send sketch of teeth.

LIST OF PARTS.

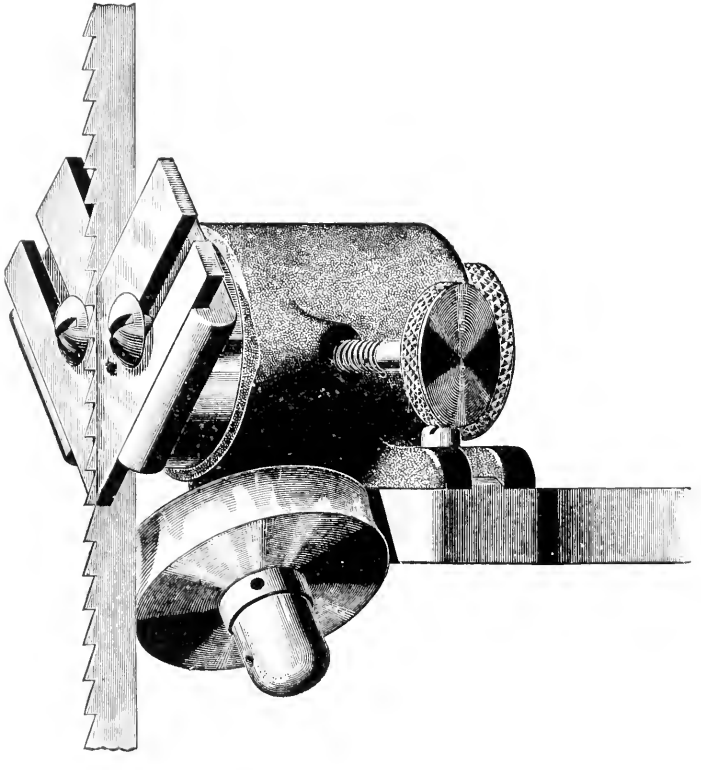


Order parts by number and state whether pieces are to be used on the No. 1 or No. 2 swage.

Band Saw Guide.

An important and vital feature of a band saw machine is the Saw Guide.

To insure even and easy running it is necessary that the blade should move with all possible freedom and the best guide is one that offers the least resistance to the motion of the blade.



The following cut illustrates a guide calculated to prevent the friction at the back of the blade.

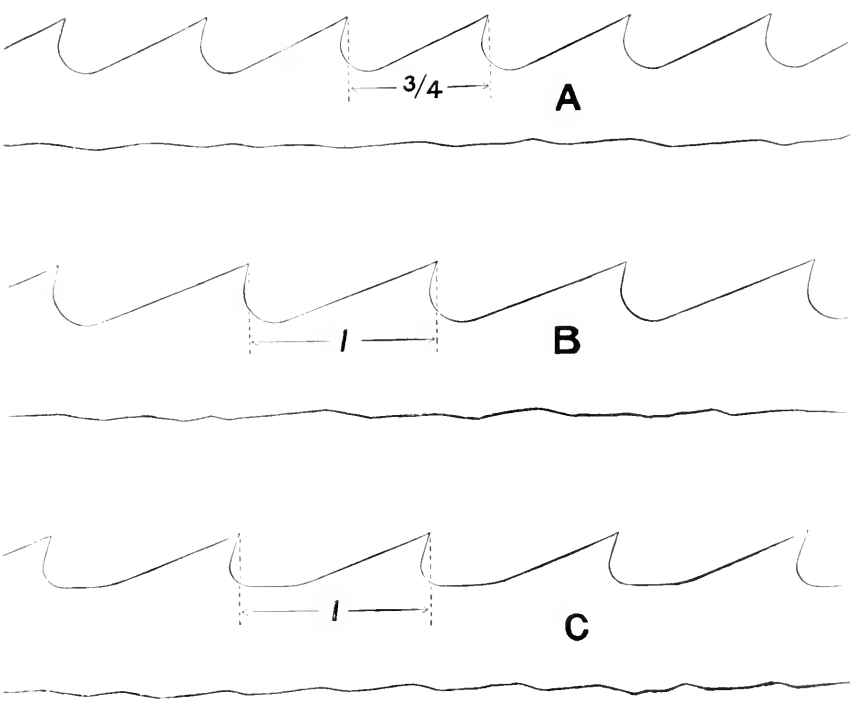
The guard-wheel is set at an angle below the side guide pieces, and being fitted with ball bearings it revolves with the downward motion of the saw the instant the back of the blade is forced against it, thus preventing twisting, cramping and case-hardening of the saw.

This guide is adapted to all widths of band saws up to two inches and is easily adjusted to any make of machine.

Shapes and Spacing of Teeth Used in Band Saws.

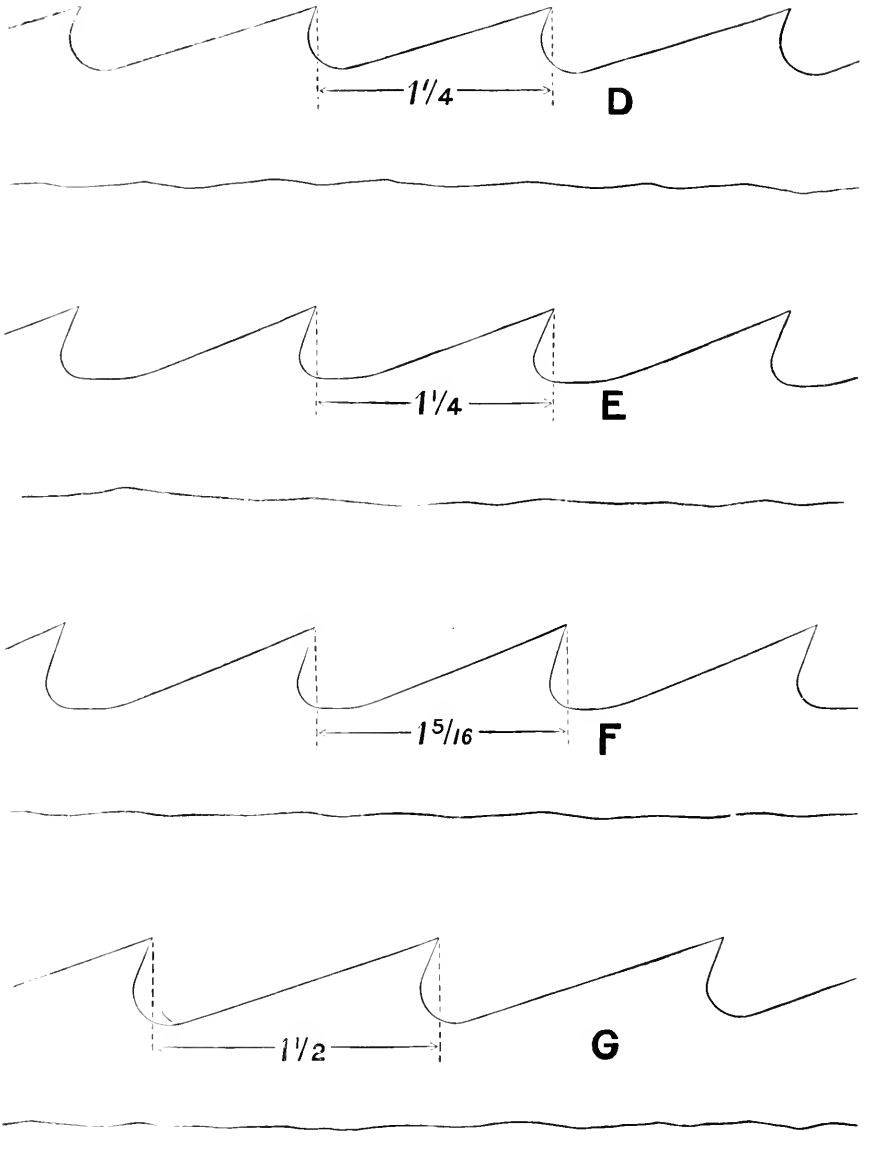
SPECIAL PATTERNS MADE TO ORDER.

Band Re-Saw Teeth.



Above illustrations FULL size. ORDER by LETTER on cut.

BAND RE-SAW TEETH.



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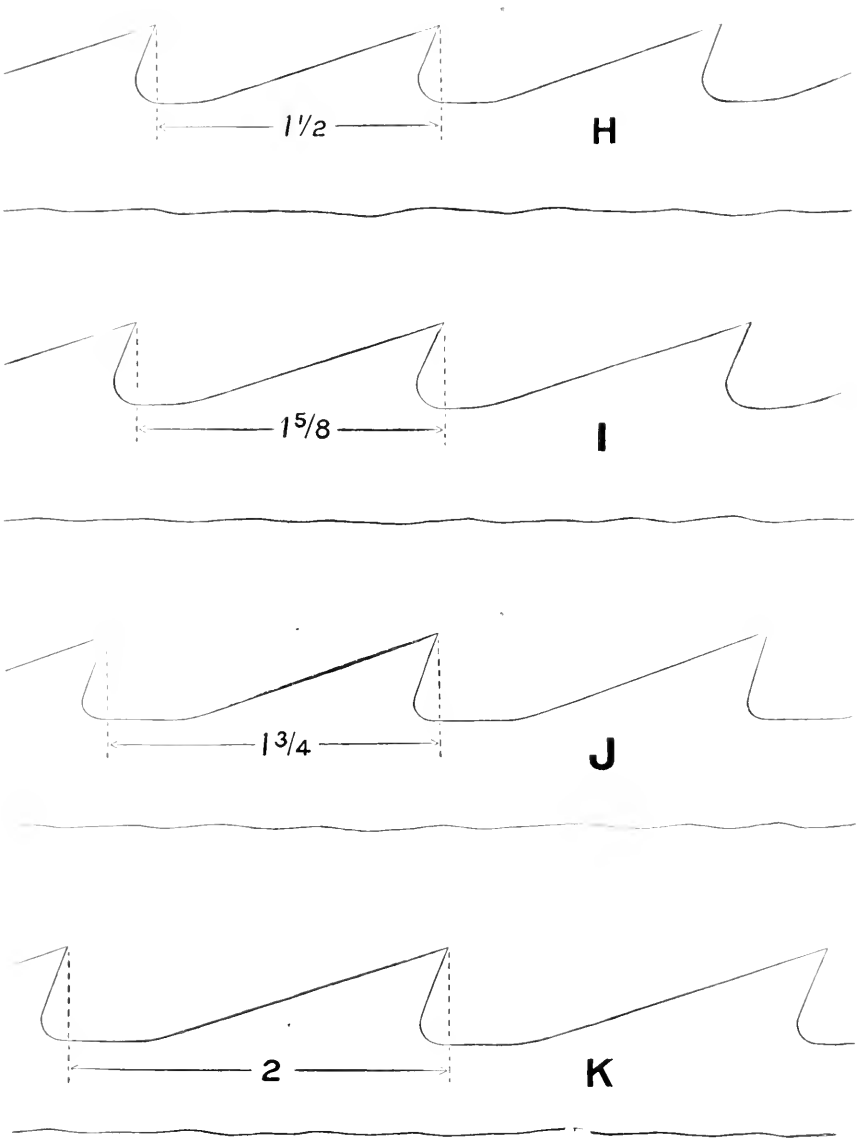
BAND RE-SAW TEETH.



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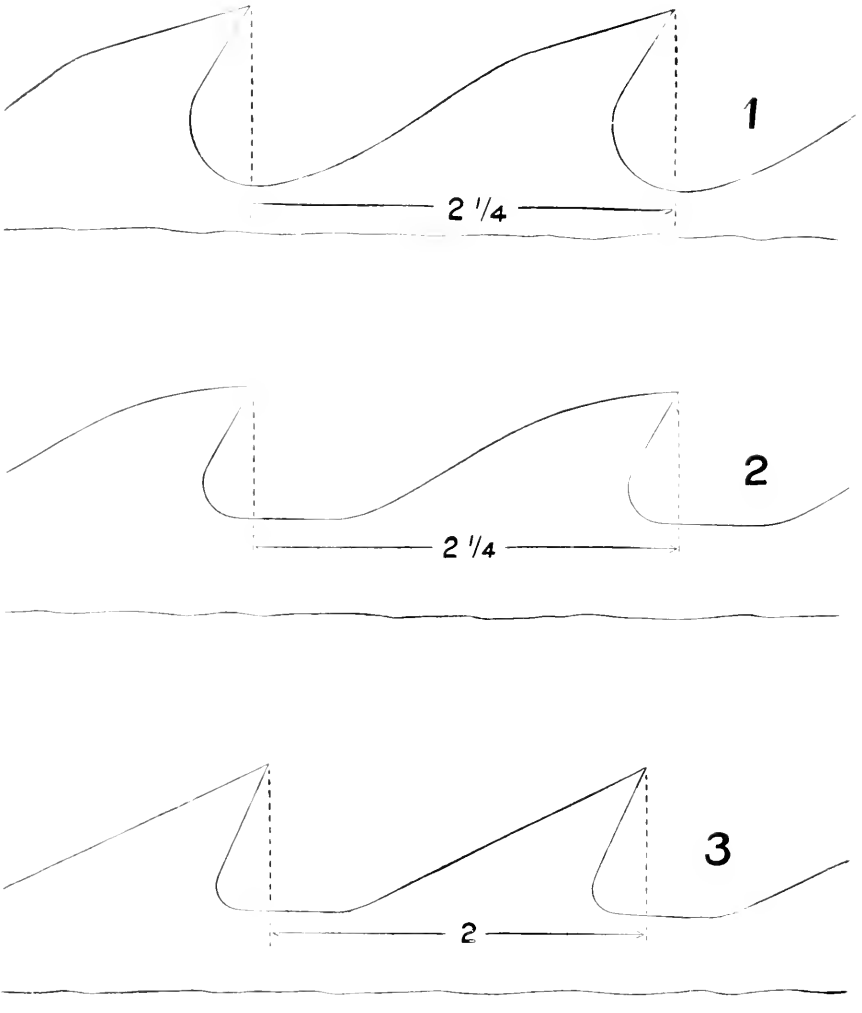
LOG BAND SAW TEETH.



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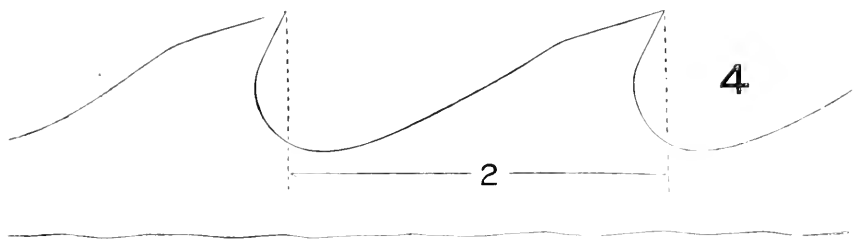
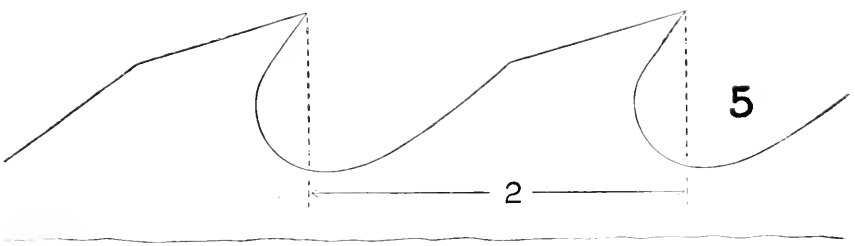
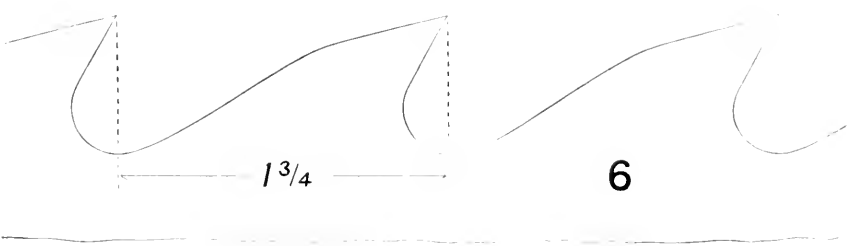
LOG BAND SAW TEETH.







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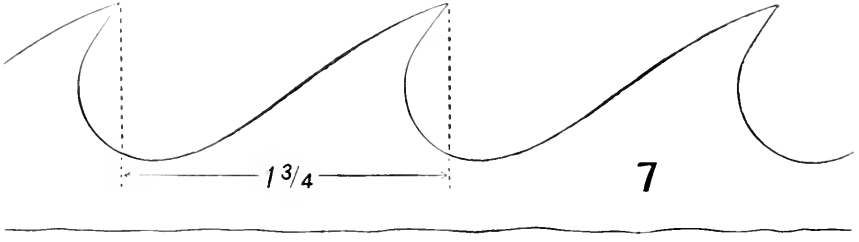
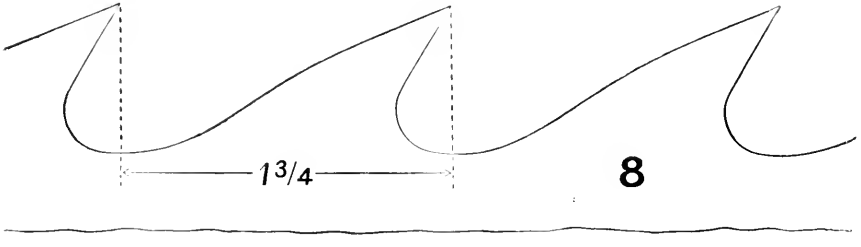
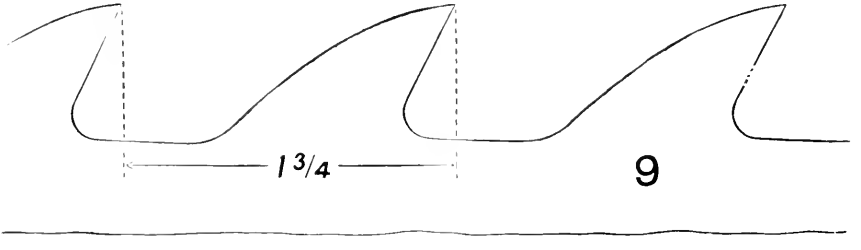
LOG BAND SAW TEETH.







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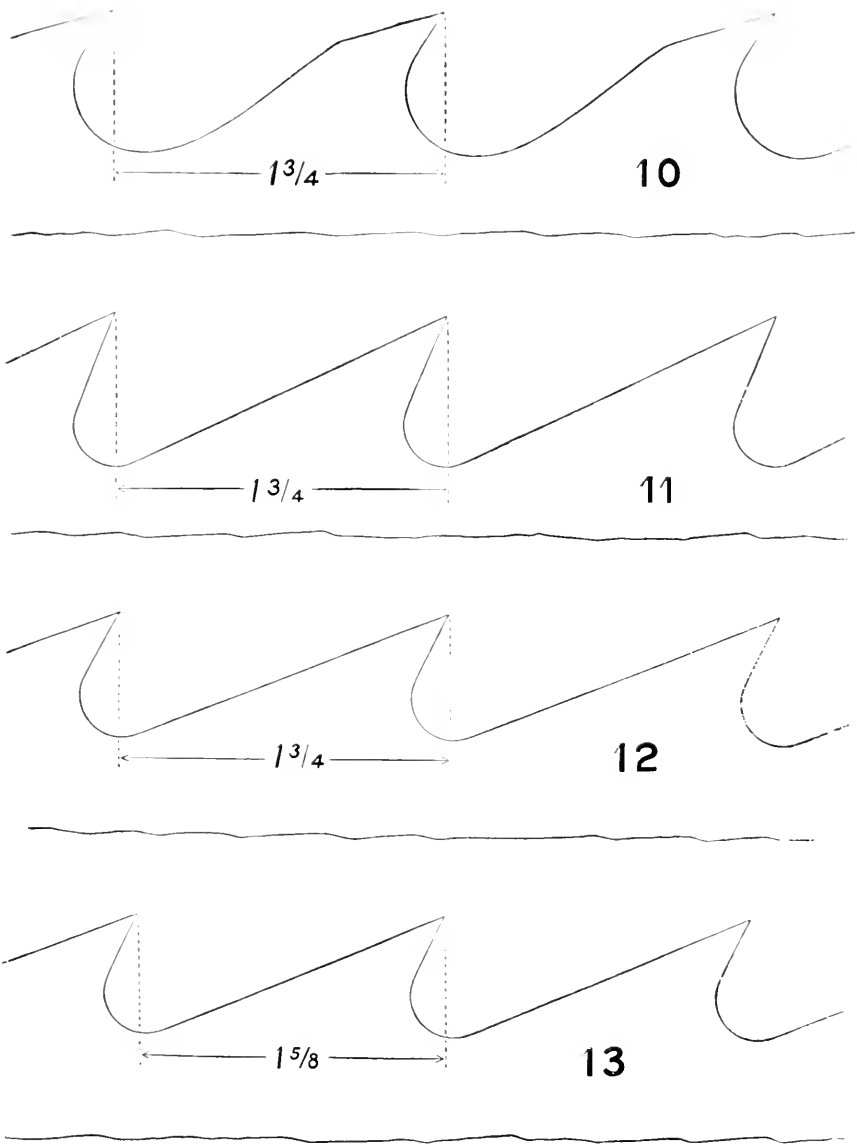
LOG BAND SAW TEETH.



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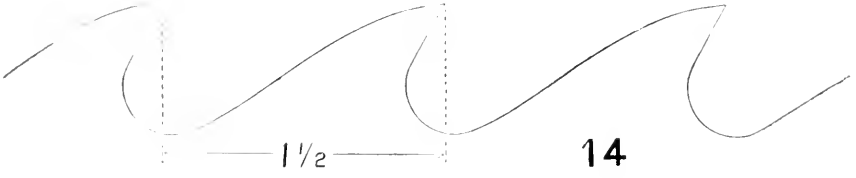

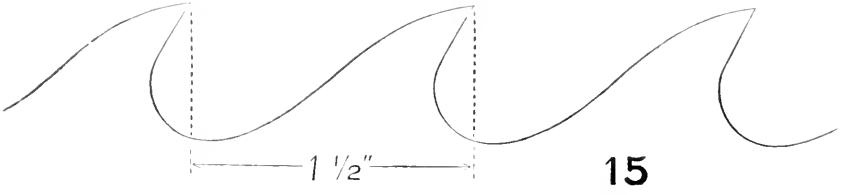

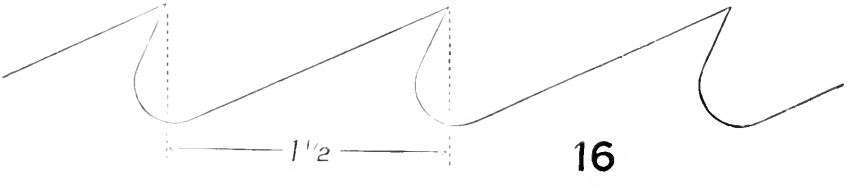

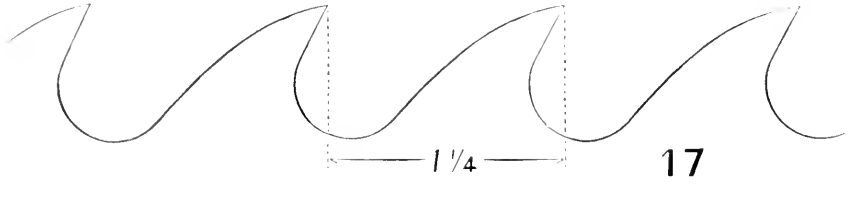

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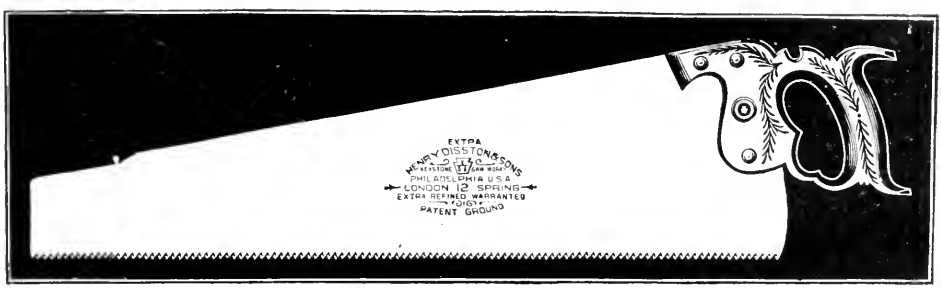
Construction

of

Saws



and

How to Keep Them in Order.

The demand for an article of instruction on saw filing having been demonstrated to us not only by personal inquiry and letter, but also by the return of fine quality saws, pronounced defective through a lack of knowledge of how to keep them in order, or by the use of extensively advertised so-called saw sets and other tools,—which pull the saw blade apart or so distort it as to render it unfit for use—has led us to compile this book for gratuitous distribution for the enlightenment of the amateur and the improvement of the expert mechanic.

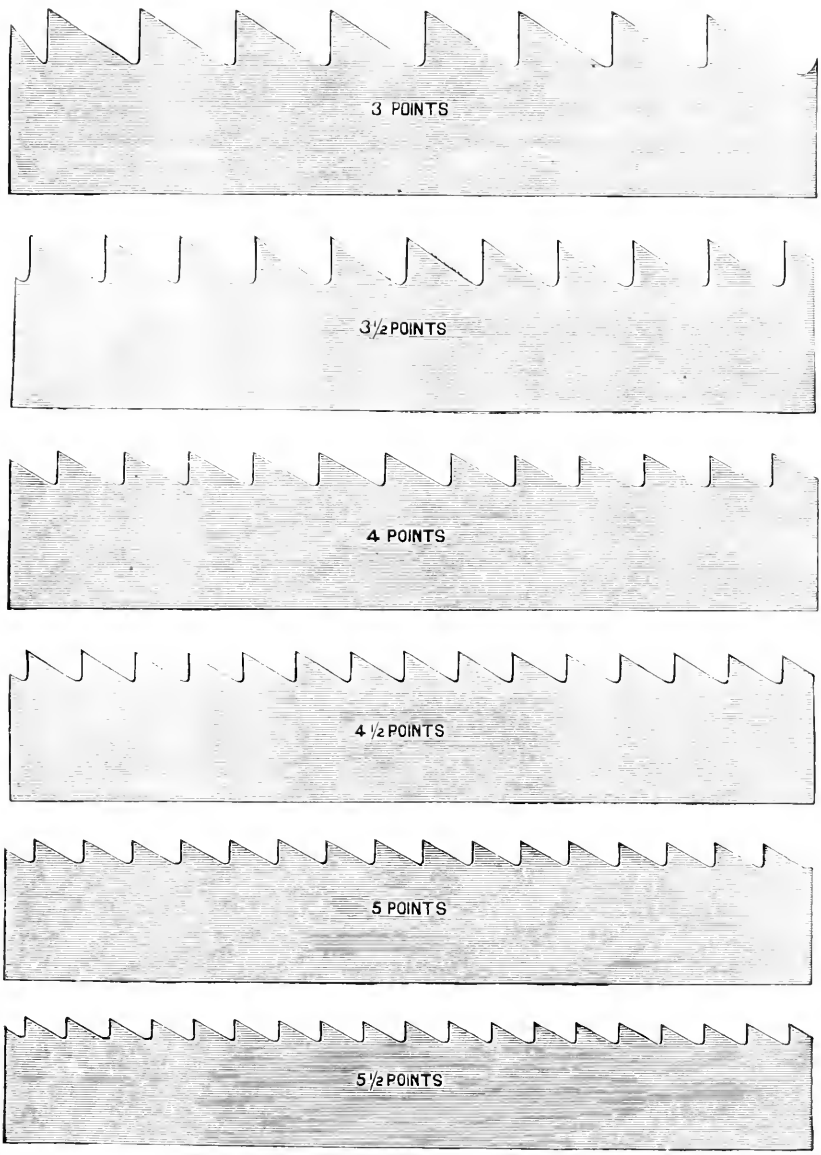
We will endeavor to give, in the following pages, such practical information as to the proper methods of keeping saws in order and of the tools with which to do so, that will overcome the above mentioned pit-falls to the proper working of the saw. We offer our large experience and the reputation of our goods for the efficiency of this treatise, which has been gleaned from the most scientific saw makers and most practical saw filers in the world. While we admit there are other methods of putting saws in order, we claim our modes to be the easiest and equally or more effective.

We take occasion to thank our patrons for their appreciation of our products. The high standard (which is the basis of our constantly increasing business) shall be maintained, and we trust thereby to retain their good will and increase our trade in future.

HENRY DISSTON & SONS', Incorporated.

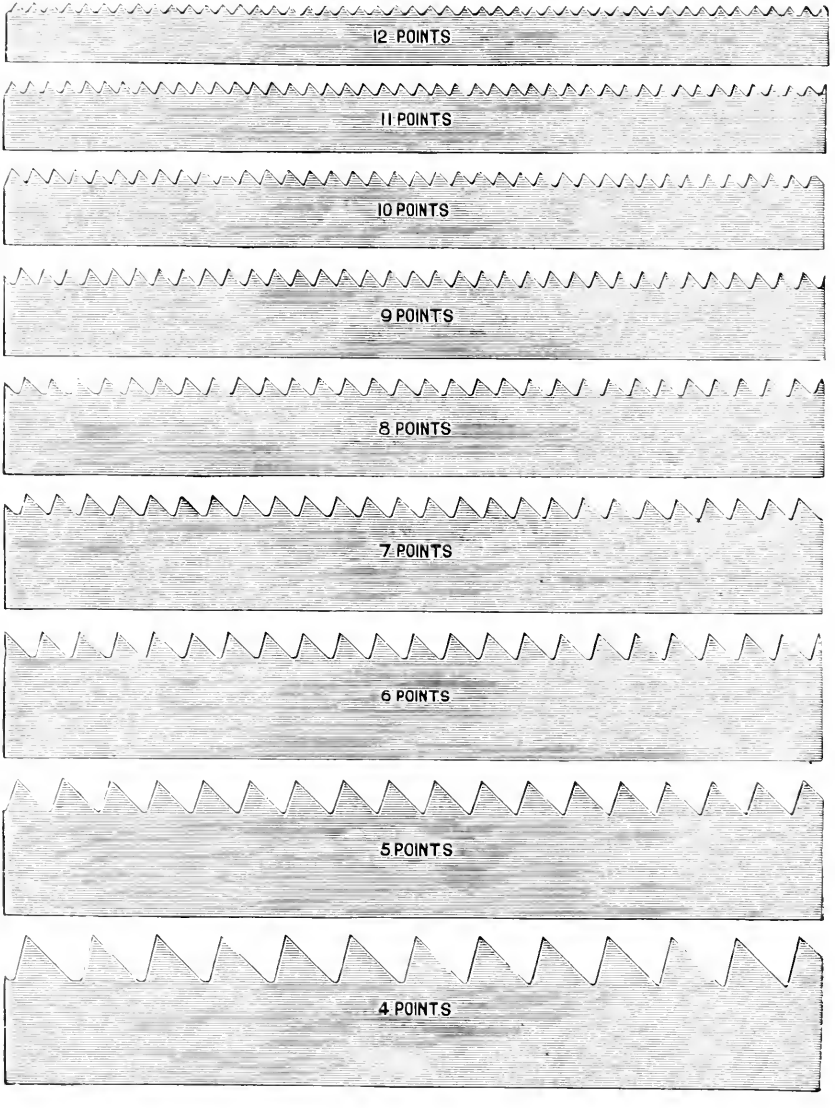
The following cuts are full size of the respective number of teeth and points per inch which they represent. Care should be taken when ordering to specify whether **teeth** or **points** per inch are intended, for it will be noticed that in one inch space there is one tooth less than there are points.

RIP SAWS.



The following cuts are full size of the respective number of teeth and points per inch which they represent. Care should be taken when ordering to specify whether **teeth** or **points** per inch are intended, for it will be noticed that in one inch space, there is one tooth less than there are points.

CROSS-CUT SAWS.



PRINCIPLE OF CONSTRUCTION.

The saw is either reciprocating or continuous in action, the first being a flat blade and practically straight edge, making a plane cut, as in hand, mill, jig and sash saws; the latter, either a circular or rotating disc, cutting in a plane at a right angle to its axis, a cylindrical or barrel shape with a convex edge cutting parallel to its axis, or a continuous ribbon or band running on two pulleys making a plain or curved cut with a straight edge parallel to their axis of rotation. Practically speaking, the teeth are a series of knives set on a circular or straight line, each tooth cutting out its proportion of wood and prevented from cutting more by the teeth on either side of it. Each tooth should cut the same amount and carry out the chip or dust, dropping it below the material being sawed. Different kinds of wood require teeth varying in number, angle or pitch and style of filing.

The perfection of a saw is one that cuts the fastest and smoothest with the least expenditure of power; to do this, it is evident that each tooth should be so constructed and dressed as to do an equal proportion of the work, for if any of the teeth are out of line or shape, they are not only useless themselves, but a disadvantage to the others. We find many good mechanics who frankly acknowledge that they never could file a saw satisfactorily; the probable reason is that they never studied the principle of the action or working of the tool. There is no reason why any man of ordinary mechanical ability should not be able to file, and keep his saw in order, but like all trades, it requires practice and study of the subject.

The following illustrations and explanations will greatly assist in the selection of a saw and show the best methods of keeping it in proper working order. These should be carefully studied.

A saw tooth has two functions—paring and scraping. A slitting or ripping saw for wood should have its cutting edge at about right angles to the fibre of the wood, severing it in *one* place, the throat of tooth wedging out the piece.

In a cross-cut wood saw, the cutting edge also strikes the fibre at right angles to its length, but severs it on *each side* from the main body before dislodging it.

RIP SAWS.

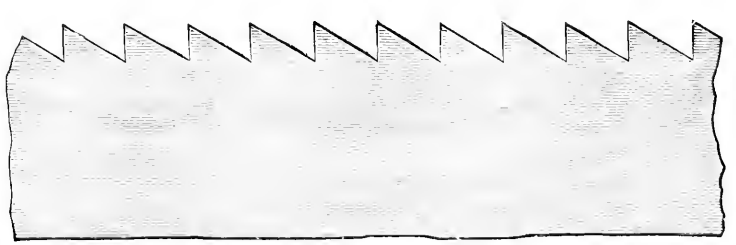


FIG. 1.

Fig. 1 is a four-point rip or slitting saw with the rake all in front, where the cutting duty is. This saw should be filed square across,

filing one-half the teeth from each side after setting, which will give a slight bevel to the cutting edge of tooth, as it should be for soft wood; for medium hard woods a finer toothed saw with five points to the inch should be used and dressed in the same manner; for the very hardest and toughest cross-grained woods a still finer toothed saw is required, with the teeth filed slightly beveling, as ripping cross-grained stuff par-

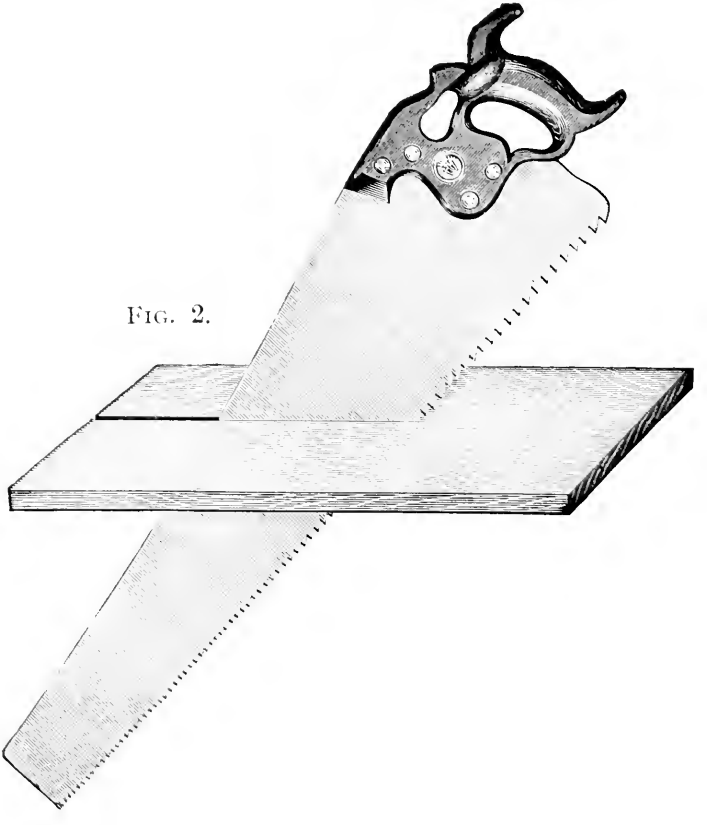


FIG. 2.

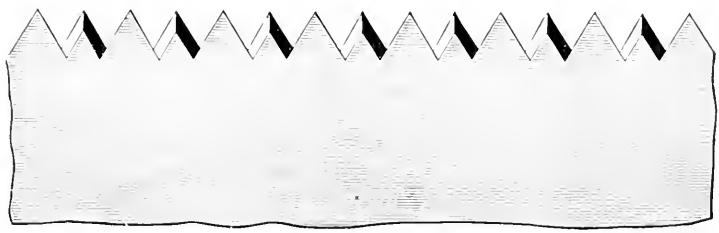
takes a little of the nature of cross-cutting. In all cases where ripping is done, the thrust of the saw should be on an angle of about 45° to the material being cut, as shown in Fig. 2, this makes a shearing cut, an advantage that can be quickly demonstrated with an ordinary pocket knife cutting any piece of wood. For ripping thoroughly dry lumber, it will be found advantageous to use an extra thin back saw which will run without set.

CROSS CUT HAND-SAWS.

In cross-cutting, the fibre of the wood is severed *twice*—on each side of the saw—the thrust dislodging and carrying the dust out.

Fig. 3 is a five-point peg tooth cross-cut saw with the rake on the side. For the same reason that the rip saw has the rake on front of tooth, the cross-cut has it on the side, as that is where the cutting duty is. The bevel or fleam to teeth in Fig. 3 is about 45°, while there is no

FIG. 3.



pitch at all; the angle on each side being the same, forms the "*peg tooth*," which is best adapted to cutting soft, wet and fibrous woods. This style of tooth is principally used in Buck-saws.

In all cases, the size and length of teeth depend largely upon the duty required; a long tooth has the demerit of being weak and liable to spring, but the merit of giving a greater clearance to the saw-dust. The throat space in front of each tooth must be large enough to contain the dust of that tooth from one stroke; the greater the feed, the deeper the dust chamber required, or, more teeth.

The first point to be observed in the selection of a saw is to see that it "hangs" right. Grasp it by the handle and hold it in position for working, to see if the handle fits the hand properly. These are points of great i nportance for comfort and utility. A handle should be symmetrical, and the lines as perfect as any drawing. Many handles are made of green wood; they soon shrink and become loose, the screws standing above the wood. We season our handle-wood three years before using. An unseasoned handle is liable to warp and throw the saw out of shape. The next thing in order is to try the blade by springing it, seeing that it bends regularly and evenly from point to butt in proportion as the width and gauge of the saw varies. If the blade is too heavy in comparison to the teeth, the saw will never give satisfaction, because it will require more labor to use it; the thinner you can get a stiff saw the better; it makes less kerf and takes less muscle to drive it This principle applies to the well-ground saw. There is less friction on a narrow true saw than on a wide one; you will get a smaller portion of blade, but you will save much unnecessary labor at a very little loss of the width.

See that it is well set and sharpened and has a good crowning breast; place it at a distance from you and get a proper light on it, by which you can see if there is any imperfection in grinding or hammering. We should invariably make a cut before purchasing a saw, even if we had to carry a board to the hardware store. We set our saws on a

stake or small anvil with a hammer; a highly tempered saw takes three or four blows, as it is apt to break by attempting to set it with but one blow. This is a severe test, and no tooth ought to break afterwards in setting, nor will it, if the mechanic adopts the proper method. The saw that is easily filed and set is easily made dull. We have frequent complaints about hard saws, though they are not as hard as we would make them if we dared; but we shall never be able to introduce a harder saw until the mechanic is educated to a more correct method of setting it. As a rule, saws are given more set than is necessary, and if more attention was paid to keeping points of teeth well sharpened, any well made saw would run with very little set, and there would be fewer broken ones. The principal trouble is that too many try to get part of the set out of the body of the plate, whereas the whole of the set should be on the teeth. Setting below the root of the tooth distorts and strains the saw-plate, which may cause a full-tempered cast-steel blade to crack and eventually break at this spot; and it is always an injury to the saw, even if it does not crack or break.

The teeth of a hand-saw should be filed so true that, on holding it up to the eye and looking along its edge, it will show a central groove down which a fine needle will slide freely the entire length; this groove must be angular in shape and equal on each side, or the saw is not filed properly and will not run true.

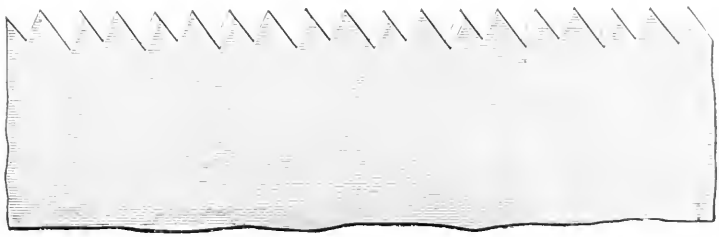
FIG. 4. FIG. 5. FIG. 6. FIG. 7.

Fig. 4 shows how the groove should appear on looking down the edge of the saw; the action should be such that the bottom of kerf will present the appearance as shown in Fig. 5, and not like Fig. 6; the cutting action is as shown in Fig. 7, the cutting being done with the outside of tooth, the fibre of the wood is severed in the two places and the wood is crumbled out from point to point by the thrust of saw.

The proper amount of bevel to give the teeth is very important, as is demonstrated by the above figures, for if too much bevel is given, the points will score so deeply that the fibres severed from the main body will not crumble out as severed, but be removed by continued rasping, particularly in hard woods, as they require less bevel, as well as pitch, than soft wood.

Fig. 8 on next page, shows a six-point cross-cut saw filed with a medium amount of bevel on front or face of tooth, and none on the back. This tooth is used in buck-saws, on hard wood, and for general sawing of woods of varying degrees of tenacity. This style of dressing is the best, but a number of saws each having teeth suited to its par-

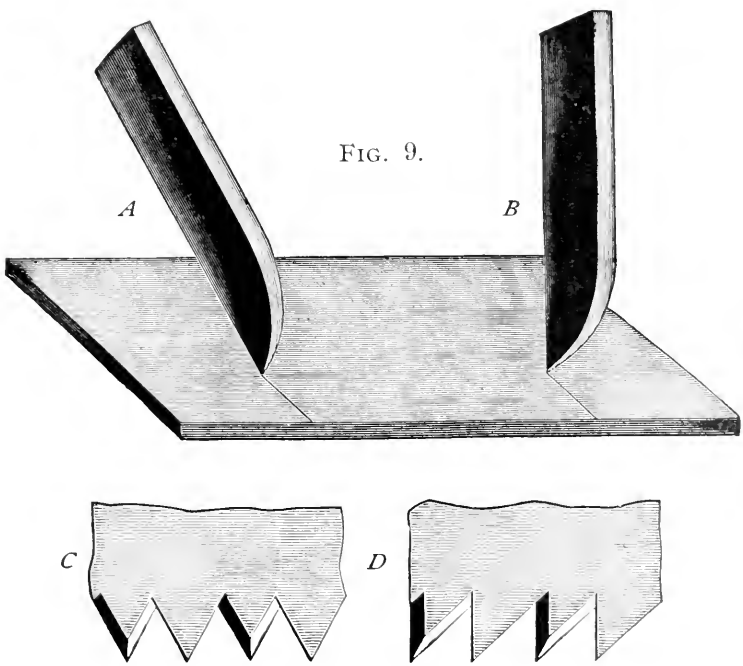
FIG. 8.



ticular work, will be found more advantageous than trying to make one saw serve for all kinds of hand saw work.

We will now consider the cross-cut saw tooth, in regard to rake or pitch; this being one of the most important features, too much care cannot be taken to have the correct amount of pitch for the duty required. To illustrate this, Fig. 9 represents a board, across which we wish to make a deep mark or score with the point of a knife; suppose

FIG. 9.



we hold the knife nearly perpendicular as at *B*, it is evident it will push harder and will not cut as smoothly as if it was inclined forward as at *A*; it follows then that the cutting edge of a cross-cut saw should incline forward as at *C*, rather than stand perpendicular as at *D*.

Too much hook or pitch, and too heavy a set are very common faults, not only detrimental to good work but ruinous to the saw; the

first by having a large amount of pitch, the saw takes hold so keenly that frequently it "*hangs up*" suddenly in the thrust—the result, a kinked or broken blade; the second, by having too much set, the strain caused by the additional and unnecessary amount of set is out of proportion to the strength of the blade, and is broken in the same manner. The most general amount of pitch used is 60°, though this may be varied a little more or less to advantage, as occasion may demand.

The next point to be considered is the bevel, or fleam, of the point. In Figs. 10, 11 and 12, the filer, as in all cases, files from the heel to the point, which is the only correct way. The file is supposed to be

FIG. 10.

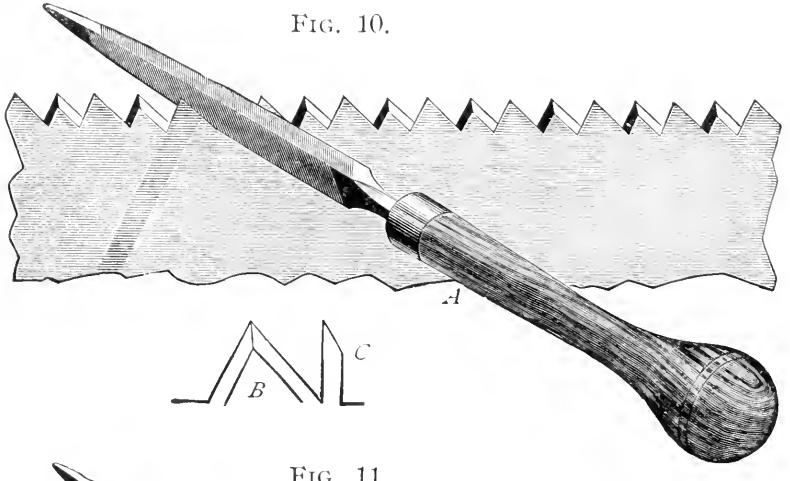
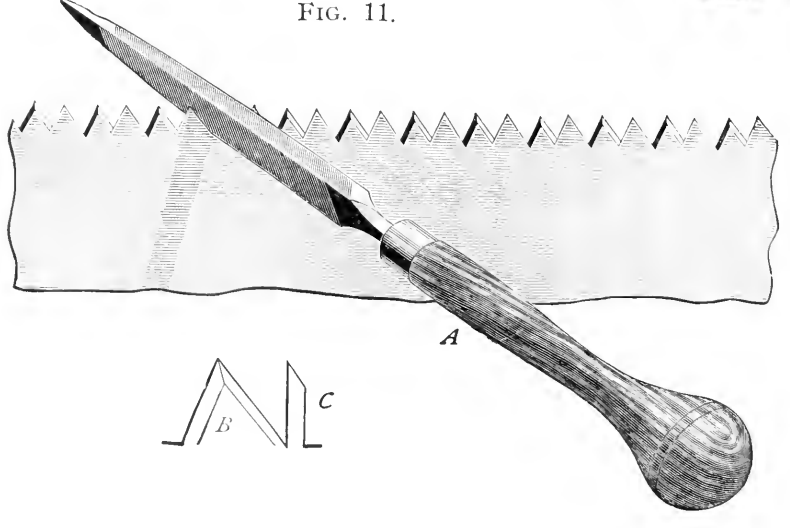


FIG. 11.



horizontal to the perpendicular of the side of saw, and on an angle of about 45° longitudinally with the length, measuring from file line toward heel.

Fig. 10 is a five-and-a-half-point cross-cut saw showing the same amount of fleam front and back; this saw is best suited for work in soft wood, and where rapid, rather than fine work is required. *A* shows the position of the file, *B* an exaggerated view of shape of point, and *C* the shape of point.

Fig. 11 is a seven-point saw for medium hard woods, illustrated in same manner as Fig. 10. This tooth has less fleam on the back, which gives a shorter bevel to point, as at *C*.

FIG. 12.

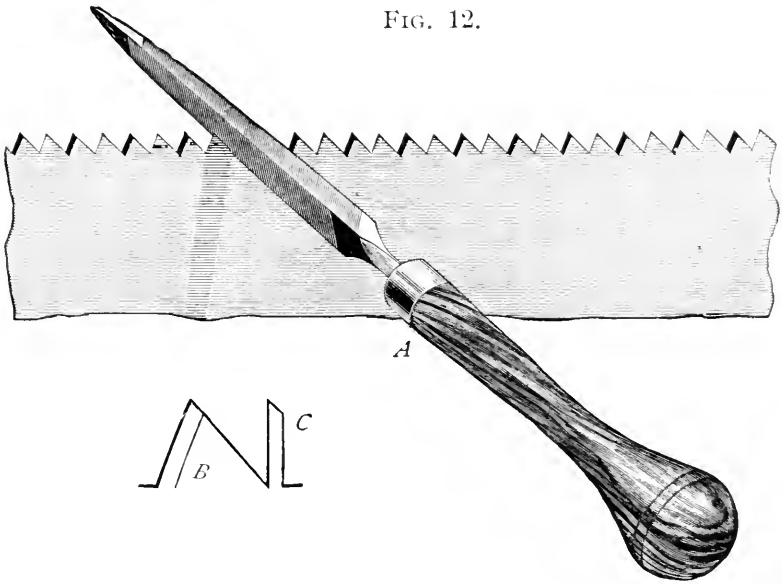


Fig. 12 is a still finer saw, having ten points to the inch. This saw has no fleam on back, the result being very noticeable at *C* and *B*. This style of point is for hard wood.

It will be seen that the bevel on the front of teeth in Figs. 10, 11 and 12 is the same, but the bevel of the point looking the length of saw is quite different, consequent upon the difference in the angles of the backs.

FIG. 13.

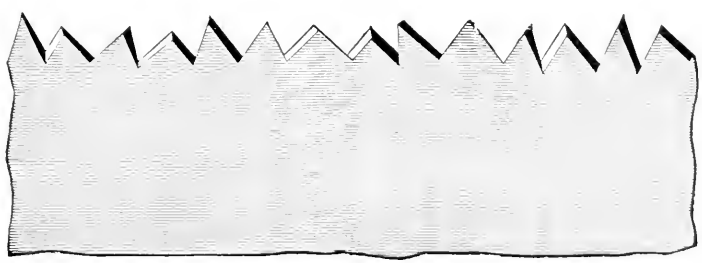


Fig. 13 is a representation of some of the saws we have seen; there

are entirely too many such now in use, and we have no doubt their owners are shortening their lives in the use of them as well as those of the saws. To owners of such saws we say, take them to the factory and have them retoothed, or buy a new saw and take a fresh start, and steer clear of this style of filing.

As we said in the preceding pages, and as will be seen by Figs. 10, 11 and 12, the filing should be done from the heel of saw toward the point. Many practical saw filers contend this is wrong, that the filing should be done from point of saw toward the handle, but the only support they have for their theory is that they do away with the feather edge that the filing from the heel of saw puts on the cutting face of tooth. The feather edge is no objection, as the main part of it is removed when the teeth are side-dressed after filing, as we direct in our summary of saw filing on page 142. Against the correctness of filing from point to handle may be cited the following objections:

Where a different angle of back is required (it being remembered that angle of face should be the same in nearly all cross-cut hand saws, and that angle of back governs angle of point), it will be found very difficult to obtain it without changing angle of face of tooth, and as the cutting duty is on the long side of face, any change is of course of great influence.

Again, (though we think the above argument sufficient) to file from point of saw, it is necessary to file with the teeth bent toward the operator; this will cause the saw to vibrate or chatter, which not only renders good, clean, even filing impossible, but breaks the teeth off the file.

In the preceding illustrations, we have only given the coarser saws that are in most general use, but the same principle of filing should be applied to the finer toothed saws regarding angles and pitch suitable for woods of different degrees of hardness, the only actual difference being that one saw has finer points, and they being finer, require a little more care and delicate touch in setting and filing.

FIG. 14.

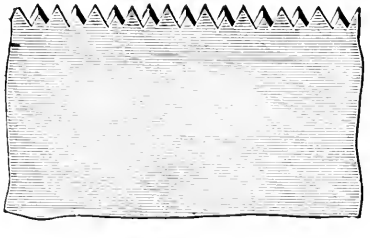
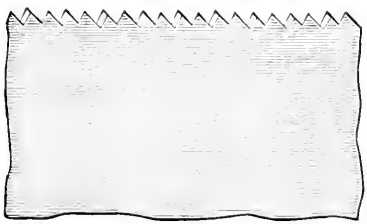


Fig. 14 is a section of an eleven-point saw suitable for the finer kinds of work on dry, soft woods, such as cutting mitres, dove-tailing, pattern work, etc.

Fig. 15 shows a section of saw with same number of points as Fig.

FIG. 15.



14, but filed same as Fig. 12. This saw is for finer work, same as Fig. 14 only on the medium hard woods.

FIG. 16.

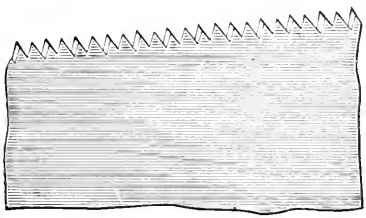


Fig. 16 is a still finer saw for fine work on the very hardest woods having same dress as Fig. 14.

FIG. 17.

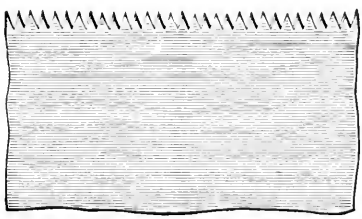


Fig. 17 is the finest toothed saw of its kind that is made for wood. All the above mentioned saws in Figs. 14, 15, 16, and 17, are made especially hard and will not admit of setting, but being made thinner at the back, when properly filed, will cut clean and sweet. Teeth such as shown in Fig. 17 are used principally on back saws and smooth cutting hand-saws. To maintain the original shape of these teeth use our cant safe back file.

FIG. 18.

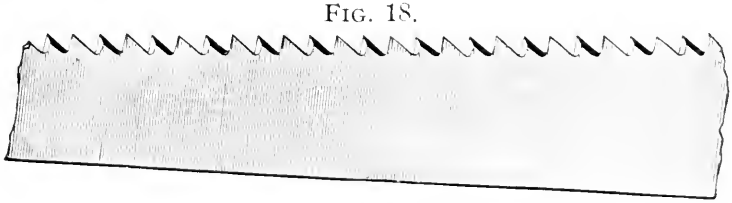


Fig. 18 is a section of a pruning saw which differs from a cross-cut hand-saw in being thicker, having a little more pitch to the teeth and

being ground thinner on the back in proportion to its width. These, of course, are made for cross-cutting only, as there is not as great a variety in the work, nor as much difference in the woods to be sawed as to degrees of hardness, being used only as a pruning saw on fruit and shade trees, which are always practically green and comparatively soft.

The illustration on page 137 shows number of points, pitch and bevel most generally used and best adapted to such work.

The "nib" near the end of a hand-saw has no practical use whatever, it merely serves to break the straight line of the back of blade and is an ornamentation only.

COMPASS SAWS.

These saws are for miscellaneous sawing. The best form of tooth for this purpose is the same as Fig. 18, excepting that it has a trifle less bevel. As the nature of the work partakes about as much of cross-cutting as of ripping, and as a cross-cut saw will rip better than a rip will cross-cut, it is apparent the shape of tooth should be between the two. These saws are all ground thinner at back but set same as any hand-saw.

Scroll and web saws are ground, filed and set in the same manner, and should have pitch according to the work to be done. If more ripping than cross-cutting is done, as in large felloes, more pitch is given than in compass saws and *vice versa*, though these saws are almost universally run with a rip-saw tooth and have very little variation in the pitch.

BUTCHER SAWS.

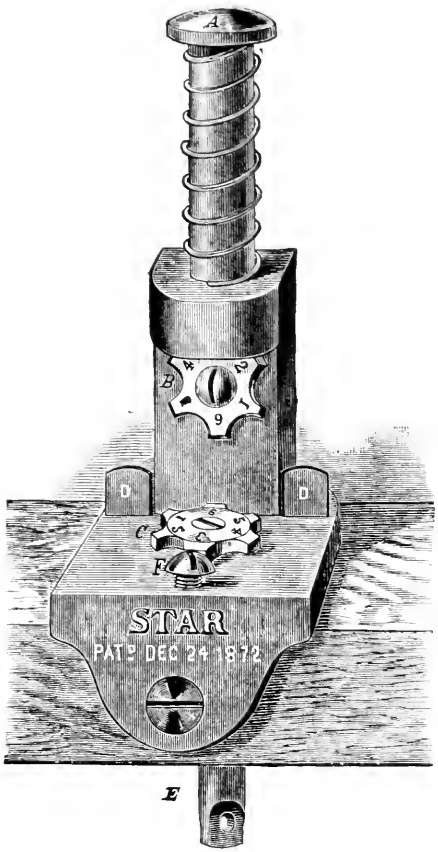
These saws are for cutting bones. The pitch and number of points are about the same as a fine tooth hand-saw for medium hard wood, but filed straight through without fleam or bevel to teeth, with light, even set, same as in fine hand-saws.

HACK SAWS.

These saws are for cutting metal, such as brass, iron, or untempered steel, and should have a little finer tooth than the average butcher saw. They are so hard that none but the best superfine files will sharpen them. Like the butcher saws, the filing must be straight through and no bevel.

SETTING SAWS.

This is an important part of the work of keeping a saw in order and should always be done *after* the teeth are *jointed* and before filing. In all cases the set should be perfectly uniform, as the good working of the saw depends as much on this as on the filing. Whether the saw is fine or coarse, the depth of set should not go, at the most, lower than half the length of the tooth, as it is certain to spring the body of saw if not break the tooth out. Soft, wet woods require more set as well as coarser teeth than dry, hard woods. For fine work on dry woods, either hard or soft, it is best to have a saw that is ground so thin on the back that it requires no set; such saws are made hard and will not stand setting, and an attempt to do so would surely break the teeth out.



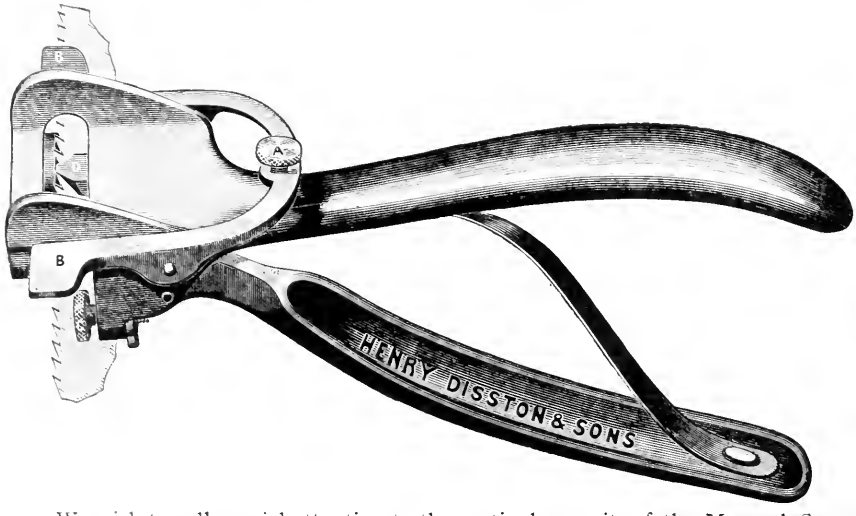
THE STAR SAW-SET.

There are many saw-sets that ruin the saw; the best form is one that involves the principle of the hammer and anvil; with such a set the teeth would all be bent evenly, and cannot be otherwise, though repeated blows be given. In the Star saw-set, represented in the following engraving, this principle is involved, and we guarantee this tool to do the work satisfactorily.

Prominent among the advantages claimed for this set is that it can be operated by the foot by means of a treadle, thus leaving the hands free to guide the saw; or it can be used by striking on the top with a light mallet.

A is the plunger, operated by a treadle attached to *E*, under the machine, a slight tap with the foot setting the tooth; *B*, the hammer or striking part; *C*, the anvil; *D*, the movable gauge; *F*, the screw to regulate the amount of set. The striking part, and the anvil, or portion which receives the blow, are star-shaped, and similar in construction. The points are all of different sizes, numbered from one to six, and are designed to set different sized teeth. It will strike a blow as sharp and effective as though by a hammer, and is the most useful and complete saw-set that has ever been offered. If the saw is hard, several blows should be given in setting it, raising the back of the saw from the guide-screw *F* when the first blow is given, and gradually lowering it with each blow until the process is complete; thus many a good saw will be saved from utter ruin. A trial will suffice. Be sure to clean the saw teeth before setting.

MONARCH PATENT SAW-SET.



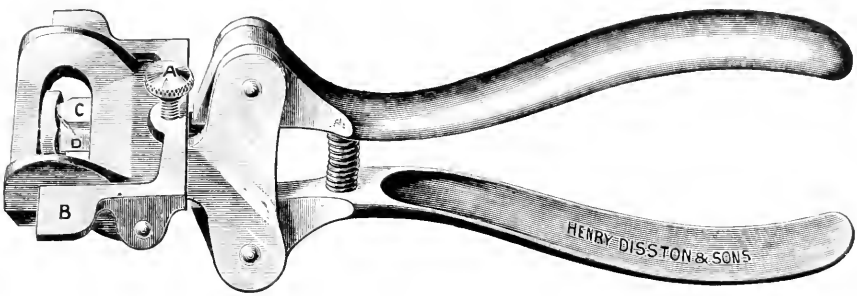
We wish to call special attention to the particular merits of the Monarch Saw Set. Many Hand Saw sets are imperfect for the reason that the power is applied by the upper handle of the tool, making it necessary to change the position of the hand every time the pressure is given to the tooth. To perfectly set a saw it is necessary that the Saw-Set should be held in the same relative position on every tooth. In the Monarch, the power is applied by the lower lever, making it very easy to hold the saw-set in the proper position and obtain the necessary pressure by simply closing the fingers. You will notice the head of the set is made open and the work is plainly in view at all times, enabling the operator to quickly adjust the Saw-Set to the tooth. The gauge "B" for regulating the depth of set has a wider bearing than in most Saw-Sets, thus doing away with the tendency to incline the tool to one side or the other, which would give an uneven set to the teeth. The anvil is fitted with four beveled surfaces suitable for different sizes of teeth. The amount of set on each tooth is regulated by set screw "C" which is held firmly in place after adjustment by the small lock-nut or lever in the rear. This is of considerable importance, as the screw "C" cannot work loose during the operation of setting, which is the case with many other saw-sets, and insures an even amount of set throughout the entire length of blade. First adjust the anvil so that the bevel most suitable for the size tooth to be set is brought into position; hang the Saw-Set on the saw so that guide "B" rests on the teeth; adjust this guide for the depth of set to be given by use of set screw "A." Use care not to go too deeply into the tooth as all of the set should be in the tooth itself. Taking too deep a hold is liable to distort the body of the blade, or break out the teeth. The top of plunger "D" should be in line with the top of the tooth to be set. Next adjust set screw "C" for amount of set required taking care not to put on any more set than is absolutely necessary.

The Monarch Saw-Set is manufactured in two sizes; the smaller size being suitable for Hand Saws, Back Saws, etc., and the larger size for Circular, Cross-cut Saws, etc. Each size is finished either Japanned or Polished.

TRIUMPH SAW-SET.

PATENTED Oct. 31, 1899.

Specially Adapted for Hand Saws, Cross-Cut Saws, Circular Saws and all Small Saws.



The idea embodied in this Saw-Set is one that will commend itself to every user of a saw-setting tool. The principal feature is the use of two plungers operated by the two levers or handles; pressure on the lower lever forcing plunger "D" against the body of the saw, thus holding it rigidly in position and preventing slipping, whilst a continuation of the pressure on the upper lever operates plunger "C" in setting the tooth.

In action it is easy and powerful, and while it will perfectly set wide and heavy saws, it is also particularly adapted for narrow blades, such as web saws, narrow band saws, etc. If the gauge "B" is properly adjusted, the result will be a uniformity of set that cannot be obtained by any other hand set.

Another important point is the head of the Set is made open, enabling the operator to quickly adjust the Saw-Set to the tooth, the work being in plain view at all times. The gauge "B," for regulating depth of set, has a wider bearing than in most saw-sets, thus doing away with the tendency to incline the tool to one side or the other, which would give an uneven set to the teeth. The anvil is fitted with four beveled surfaces, suitable for different sizes of teeth.

IN OPERATING first adjust the anvil so that the bevel most suitable for the size tooth to be set is brought into position; hang the Saw-Set on the saw so that the gauge "B" rests on the teeth; adjust this gauge for the depth of set to be given, by the use of set-screw "A." Use care not to go too deeply into the tooth, as all of the set should be in the tooth itself. Taking too deep a hold is liable to distort the body of the blade or break out the teeth. The top of plunger "C" should be in line with the top of tooth to be set.

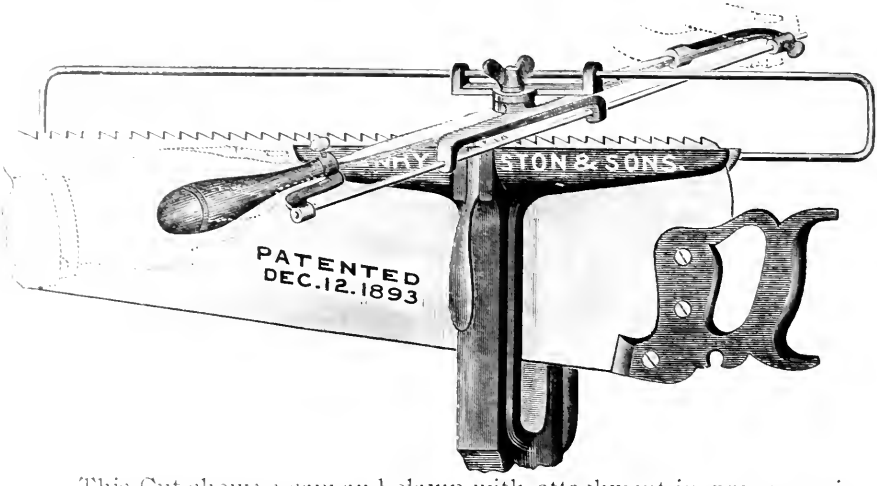
We claim this to be the best Hand Set ever put on the market, and a trial will convince anyone of its superior merits. If the instructions as to adjustment are are carried out the results will be entirely satisfactory to the operator.

The **Triumph Saw-Set** is manufactured in three sizes, the smaller size being suitable for Hand Saws, Back Saws, Web Saws, narrow Band Saws, etc.; the medium size for small Circular Saws, etc., and the large size for Cross-cut Saws, Circular Saws, etc.

Made only in POLISHED FINISH

DISSTON'S SAW FILING GUIDE.

Especially Designed to Assist Those Not Skilled in the Art of Saw Filing to File a Saw Correctly.



This Cut shows a saw and clamp with attachment in proper position for filing the first side. There are three marks on one of the hubs of the swivel attachment, and one mark on the other. One of the three marks show when it is in position for first side and the other designates when it is in position for filing the other side. The third, or centre mark, shows when it is in position for filing Rip Saws. To obtain the correct position loosen the wing nut and move the guide around to the point desired; after tightening wing nut, loosen screw in file handle until file gives the shape tooth wanted.

A good way is to select a tooth of correct shape and let file down into it, tighten set screw in handle, then file a tooth to see if the shape suits. If not, turn the file a little to the right or left and try another tooth until the proper shape is obtained. Then file every other tooth. When one side is filed, reverse saw and attachment and file the other teeth. For Rip Saws, place the file at right angles with the saw, and file every tooth. Always keep the file as nearly horizontal as possible.

This guide is sold only attached to our No. 3 clamp and price includes Clamp, Filing Guide, File and Handle.

Care should be taken in filing a saw to keep the teeth of uniform size—not one large and one small, one up and one down. Unless your teeth are regular, your set can never be regular. When the teeth of a saw become irregular in size, it is useless to attempt to regulate them without filing them down until all the teeth are of equal height. Then proceed to regulate the size by filing straight through. We know from experience that not one man in a thousand, be he ever so practical and proficient, can regulate the teeth of a saw without first filing down and then filing straight through. After the saw is properly set and sharpened, lay it flat on a true board, rub over the points of the teeth on the side with a smooth or partly worn flat file, which will regulate the set and insure smooth cutting, making the filing last longer.

After this operation, should the saw not run true, take another cut with the file over the side toward which it leads. A fast cutting cross-cut saw should have deep teeth. To make them deep they must be filed on an angle, to do this to advantage the clamp (see engraving) should be used and thus a deep gullet tooth can be filed as readily as a square bottom tooth.

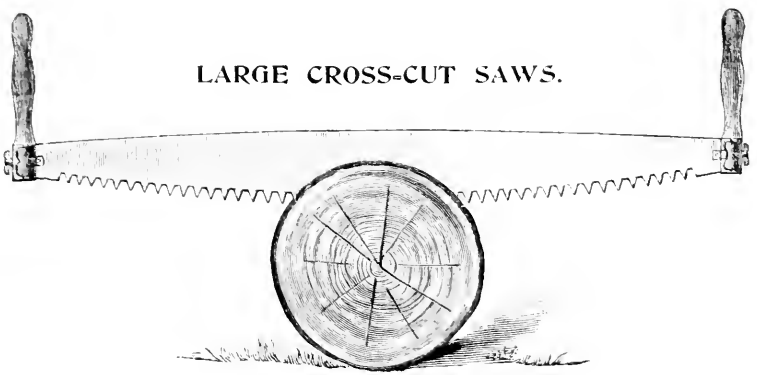


FIG. 19.

Fig. 19 represents a log of wood showing ends of grain which consist of more or less minute fibres or threads which constitute the tenacity of the wood. Our object with this saw is to sever the fibres or threads in the same manner as shown in cross-cut hand-saws. Figs. 3, 8, 10, 11 and 12, the only difference being that these large saws are constructed to cut equally well on either stroke, and that many of them have cleaner or drag teeth to carry out the dust.

The same general rules for filing and setting cross-cut hand-saws apply to these saws, excepting that the angle of tooth is same on each side; the shape and space of teeth and different amounts of fleam, of course depends, as in other saws, largely upon the work to be performed.

FIG. 20.

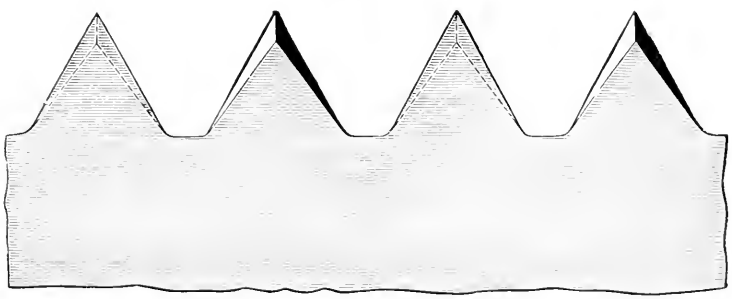


Fig. 20 represents the plain cross-cut tooth which is used in any and all kinds of wood to equal advantage, when teeth are spaced, set

and filed in accordance with instructions given in the preceding pages in relation to proper space, pitch and bevel.

FIG. 21.

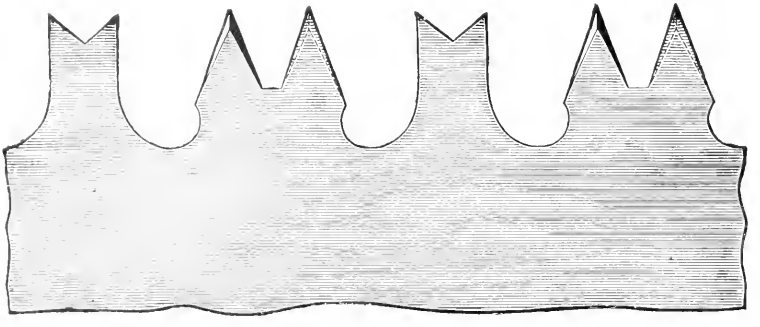


Fig. 21 represents a section of our improved Tuttle tooth-saw; the cleaner tooth must be filed square and about one thirty-second of an inch shorter than the cutting tooth. (See gauges for regulating cleaning teeth pages 57 and 64).

FIG. 22.

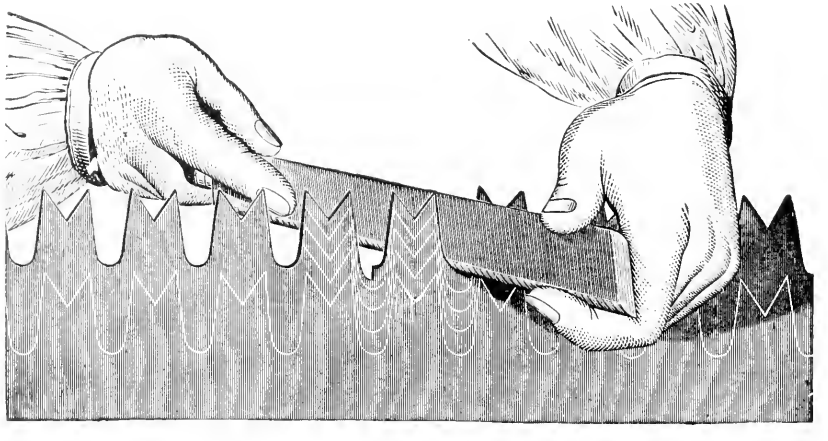


Fig. 22 is a section of our Lumberman saw, showing the style of file that should be used to preserve the original shape of tooth. The style of setting and filing this saw is the same as the ordinary cross-cut hand-saw, each alternate tooth set and filed from reverse sides.

FIG. 23.

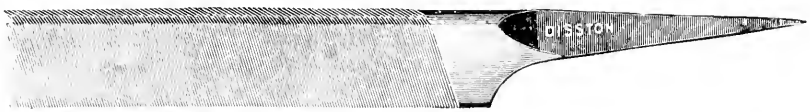


Fig. 23 represents file for keeping teeth of our Great American cross-cut saw in the same shape in which they leave our works.

FIG. 24.

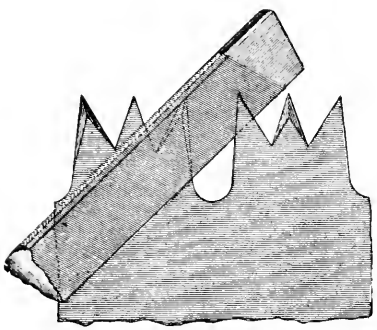


FIG. 25.

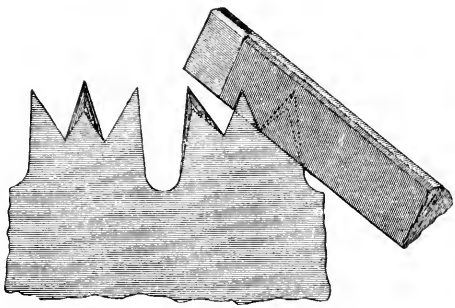


Fig. 24 shows the manner of filing the long edge of the end tooth.

Fig. 25 shows the manner of filing the short or inside edge of the end tooth.

FIG. 26.

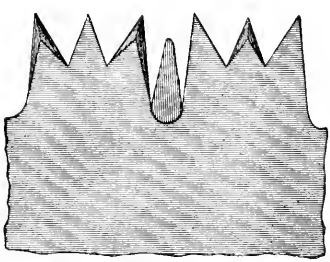
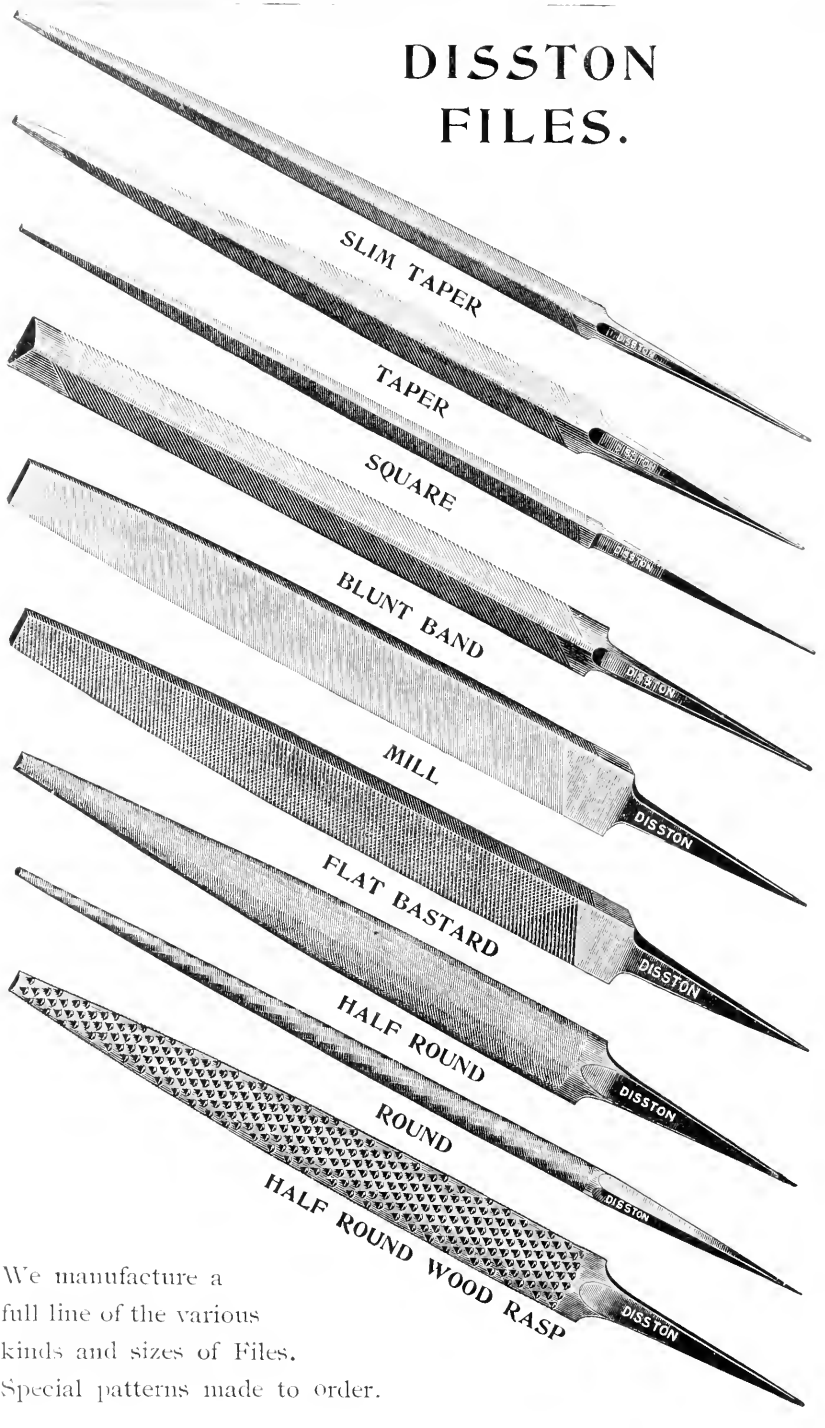


Fig. 26 shows the section of the file in the gullet of the saw.

This file, though made expressly for our Great American cross-cut saw, will be found equally serviceable in filing the "Lumberman," "Climax," and other cross-cut saws.

The Great American tooth has been subjected to the most severe test, and is the best for general use ever offered to the public. These saws are ground extra thin back, which enables them to run with less set and more ease.

DISSTON FILES.



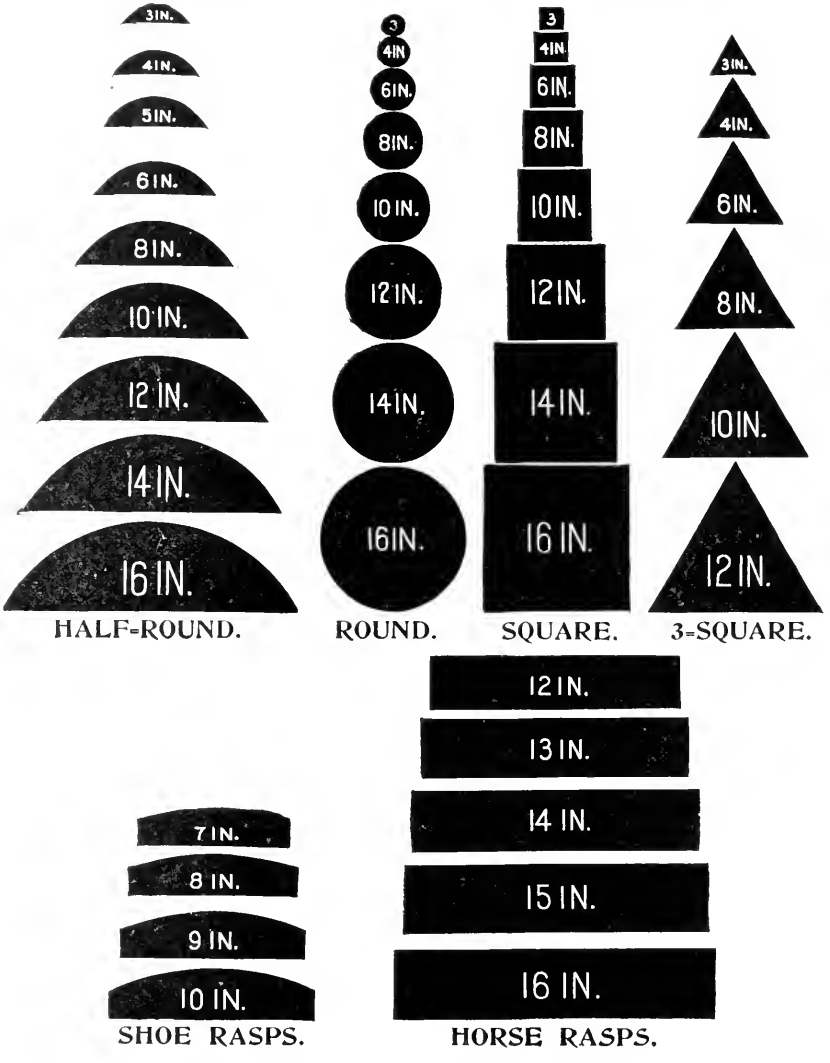
We manufacture a full line of the various kinds and sizes of Files. Special patterns made to order.

Disston Files.

Of all tools known there are none used for so many purposes and of so many styles and kinds as files. There are several hundred kinds of regular files and several thousands of regular and special combined, all of which are designated by a name according to the length, shape and grade of the cut; besides the hundreds of special names for the purposes for which they were made and used. All regular files of the different lengths and shapes are graded into three regular or usual sizes of teeth known as Bastard Cut, Second Cut and Smooth Cut. We have often been asked the meaning of the name "Bastard" as applied to the cut of a file. The name "Bastard" as applied to the cut of a file comes from the days when files were entirely made by hand and the name is supposed to have been given to a "cut" between what was termed a "rough cut" and the finer grades of cutting and the file became a standard, taking the place of rough or coarse cuts and has been known since then as the "Bastard Cut." The same is the case in the names of "Flat" Bastard and "Hand" Bastard files, while both are the same as to cut, they vary a little in shape, and both are often used for the same purpose. We show here full sectional sizes and shapes of the file steel of which most of the regular files are made. As there is considerable detail in the operations and processes of making a file which would take much space to describe and might not interest the reader or user of files, we will only say that the principal and necessary conditions of a good file are tough steel of high grade, sharp and well formed teeth, thorough hardening and careful inspection at every stage of the work.

MILL-SAW.

FLAT.

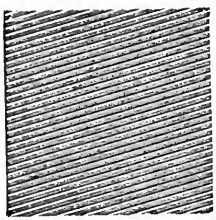


MACHINE MADE VERSUS HAND MADE FILES.

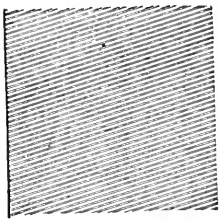
Some years ago there was much doubt, argument and speculation as to the relative quality of machine made and hand made files which now, however, has passed away in favor of the machine made files for we can and do make finer files with machinery than can possibly be made by hand; we make a file for special use in which the teeth can hardly be seen with the naked eye, there being 150 teeth to the inch. There are some files yet cut by hand and people often wonder how a file cutter can space the different grades of teeth so regularly with a hammer and chisel guided only by the eye. The fact is a hand cutter of files is not guided by sight near so much as by the feel with the

chisel and the weight of the hammer. A good hand file cutter, blindfolded, can cut one file nearly like another. We give herewith a few illustrations showing the different "cuts" in general use. These are engraved from files 12 inches long. If longer than 12 inches the "cuts" will be coarser; if shorter, they will be finer in proportion.

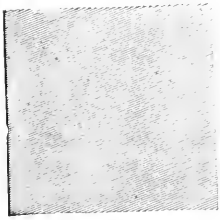
SINGLE CUT.



BASTARD.

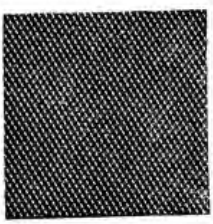


SECOND CUT.



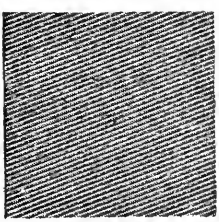
SMOOTH.

DOUBLE CUT.



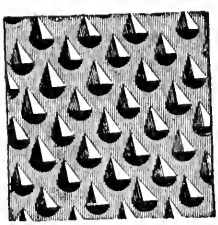
BASTARD.

SECOND CUT.

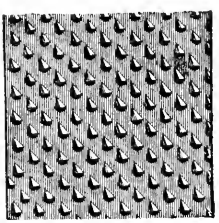


SMOOTH.

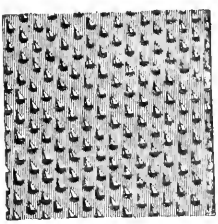
RASP CUT.



HORSE.



BASTARD.



SECOND CUT.

We desire to call particular attention to our method of sharpening the teeth of files after hardening. New Saw Files sharpened by this process will not only do more work, but will have a finer and sharper cutting edge and file a harder saw than the ordinary file.

Every person using files should have a file brush and card to keep the files free from filings. To obtain good files select the brands of the maker who has the best means of testing the quality of their own make which is strictly the case with the DISSTON brand.

HOW TO ORDER FILES.

To aid the purchaser in properly describing the different files wanted we will endeavor to define a few of the most used terms. The first point for consideration is the Length. The length of a file is measured from the *heel* (or where the tang begins) to the *point* or opposite end. Next determine the *shape* or kind of file wanted, for instance, Flat, Half Round, Mill, Square, Round, etc. The regular standard shapes are often modified to suit some special work.

Many of the shapes now accepted by the trade as regular stock goods were originated and first made by us, such as Great American Cross-cut Saw Files, Chisel Point Files for Inserted Tooth Circular saws, Acme Files with safe back for filing Hand-saws, etc.

The word "*Cut*" has reference not only to the kind or character of teeth in the file, but also to the degree of coarseness or fineness of teeth. The Cut of files is divided with respect to character of teeth into Single Cut, Double Cut and Rasp Cut; and with respect to coarseness of cut into Bastard, Second Cut and Smooth. In addition to these latter there are a few files made coarser than Bastard and known as Rough and coarse; also a few finer than Smooth, known as Dead Smooth.

The Single Cut File has one unbroken course of teeth or chisel cuts across its surface, parallel to each other but at an oblique angle to the length of the file. This Cut is used on all Mill Files, Taper Saw Files, etc.

The Double Cut File has two courses of teeth or chisel cuts crossing each other, one course being finer than the other. Double Cut is used on all Machinists' Files, such as Flat, Hand, Square, Round, Half Round, etc.

Rasp Cut differs from both the above in the respect that the teeth are not placed in parallel rows across the file, but each tooth is put in separate by a single pointed tool or punch.

Superfine Files are made in various shapes and sizes, with extremely fine teeth, graded from No. 00 (the coarsest) to No. 8 (the finest). They are used principally for fine tool making and work on fine machinery, where close, smooth filing is necessary.

Every file stamped DISSTON is warranted as perfect as a file can be made.

We manufacture in our own steel works every pound of steel that goes into the Disston Files and guarantee to use in these goods nothing but Crucible Cast Steel. We are the only File Manufacturers in the United States making the steel from which their files are produced.

Constant care as to the quality of material, shape, teeth, hardening, etc., has enabled us to produce a file that for correctness of pattern and wearing qualities cannot be excelled. Each file is carefully inspected and thoroughly proved before leaving the factory.

MACHINE KNIVES.

To produce good knives there are three important requisites:—Good steel, good temper, and good workmanship. The "Disston" knives have attained their enviable reputation through careful and constant attention to these three points.

All our steel is made especially for the purpose intended, and of a superior quality; the welding of steel face to back in the "Disston" Knives insures the strongest union possible, see illustration; the

temper cannot be excelled for uniformity and toughness, and our workmanship is the best, skilled labor can produce.

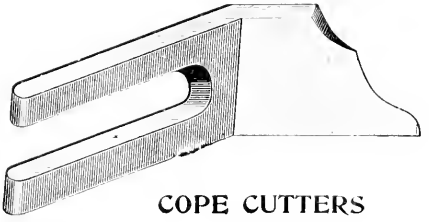
We are prepared to furnish knives of any size or kind for cutting wood, paper and metal, including Planer, Chipper, Hog, Moulding, Spoke, Stave, Stave Jointer, Mitre, Paper Trimming, Veneer and Bobbin Knives, Shear and Stop Cutter Blades, Moulding Cutter Blanks, etc.

In ordering Planer and similar knives with slots, place sample knife face down on a piece of paper and mark around to show length, position and size of slots, state width and thickness, number of knives wanted and *number in a set;* also state temper required, whether high to grind only; medium to file slowly; soft to file easily.

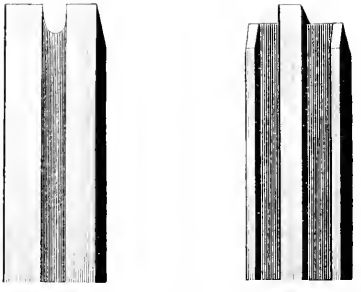
All Planing Machine Knives will be made with square backs, unless otherwise ordered.

Orders for Moulding Knives should be accompanied with sample piece of moulding or an outline drawing of shape of moulding desired, or ordered by pattern number as shown in National Moulding Book, list adopted April 15th, 1896, by Sash, Door and Blind Manufacturers' Association; also give width of cylinder head and size of bolt used.

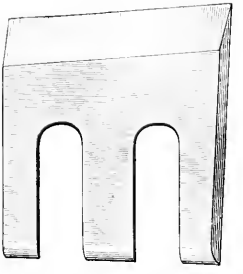
We are pleased to furnish information at all times regarding knives, also diagram sheets for marking out patterns of knives. Correspondence solicited.



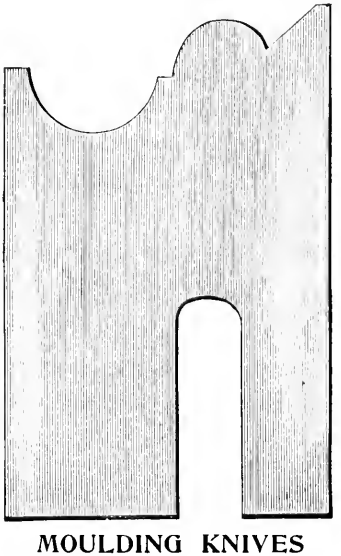
COPE CUTTERS



SOLID MILLED MATCHER BITS



SPOKE KNIVES

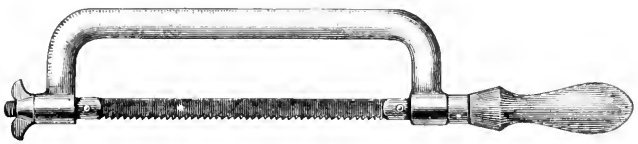


MOULDING KNIVES

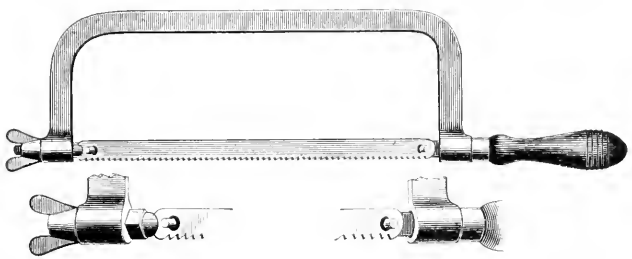
KEYSTONE REVERSIBLE HACK SAW FRAME.

Finished either Japanned or Polished with Hard Wood Handle.

Oval Back.



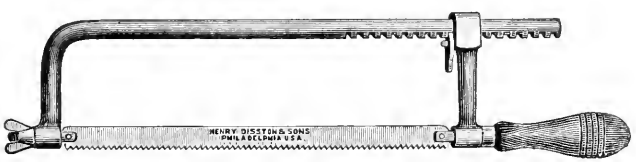
Flat Back, No. 1.



DISSTON'S ADJUSTABLE HACK SAW FRAME, No. 4.

Suitable for Saws from 8 to 12 inches.

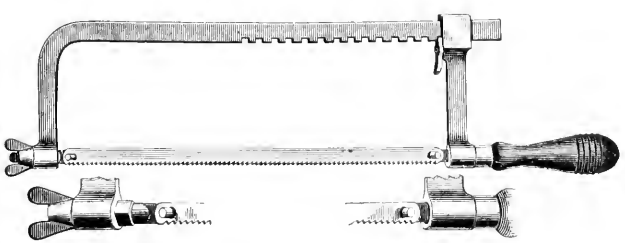
Oval Back.



DISSTON'S ADJUSTABLE HACK SAW FRAME, No. 5.

Suitable for Saws from 8 to 12 inches.

Flat Back.



HACK SAW BLADES.

The Keystone Hack-saw blades are hardened throughout and have the proper temper for the work required of them; the teeth are of correct shape for cutting metal, and will do more work and wear longer than any other similar class of hack-saws on the market.

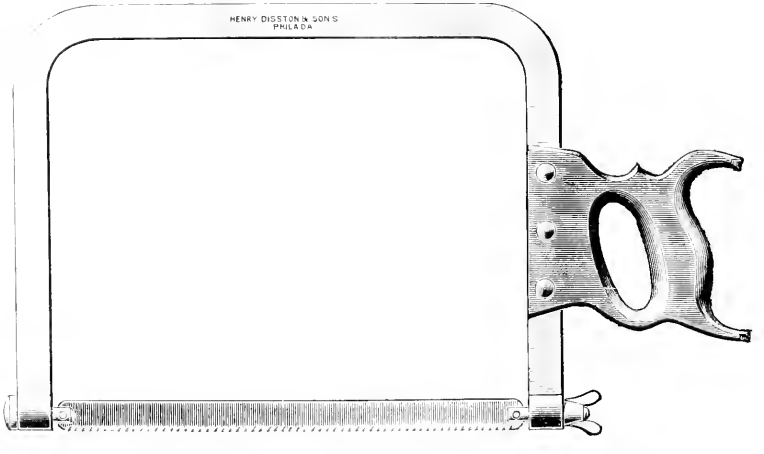
The regular stock blades are made $\frac{1}{2}$" wide, 16 points to the inch; for special work we furnish blades with 22 or 26 points to the inch, while for cutting bicycle tubing we recommend the Keystone blade with 35 points to the inch.

Flexible Hack-saw Blades are hardened only on the teeth and are furnished in regular lengths, also in coils of such lengths as used on band sawing machines.

Machine Hack-saw Blades are specially designed for use in Cutting-off or Power Machines and for heavy work.

The Disston brand of Hack-saw Blades are made of special steel, are hollow ground to run without set and are tempered so they can be re-sharpened with a good fine file.

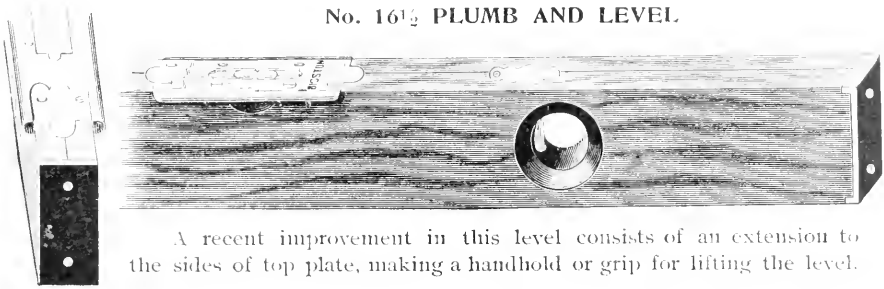
RAIL HACK SAW.



This saw is used for cutting off large Beams, Girders, etc., and is a valuable tool for contractors and structural iron workers.

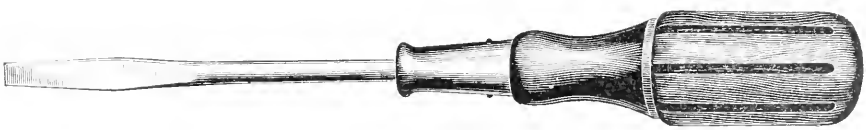
SPIRIT LEVELS, SCREW DRIVERS, TRY SQUARES, BEVELS, MARKING GAUGES, MACHINISTS RULES, SQUARES, ETC.

No. 16½ PLUMB AND LEVEL

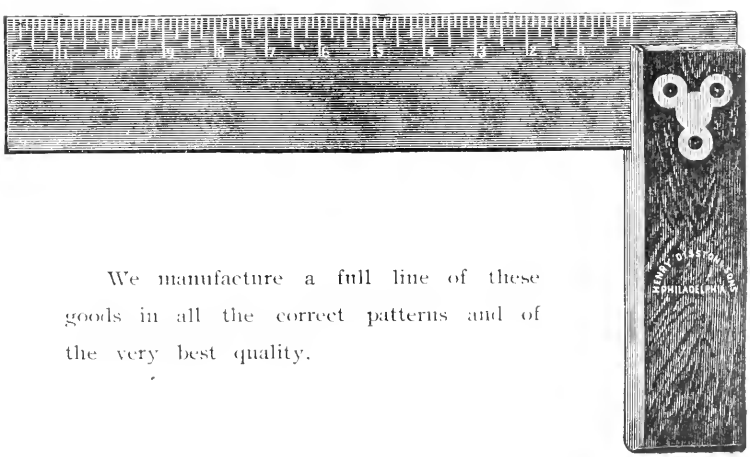


A recent improvement in this level consists of an extension to the sides of top plate, making a handhold or grip for lifting the level.

TELEGRAPH SCREWDRIVERS



No. 1 TRY SQUARE

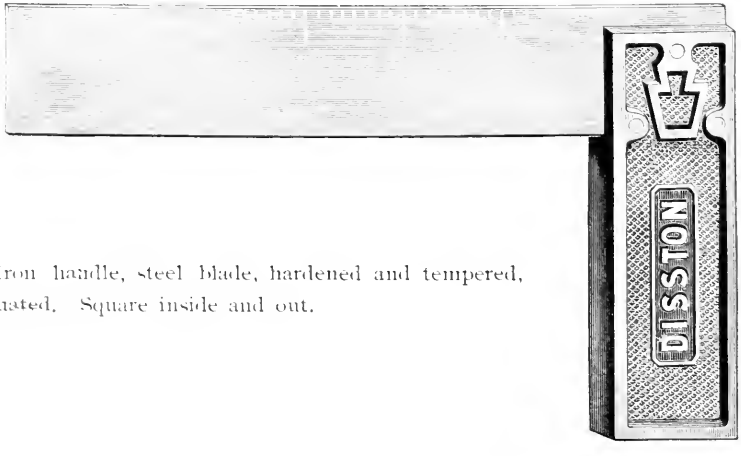


We manufacture a full line of these goods in all the correct patterns and of the very best quality.

No. 3 BEVEL

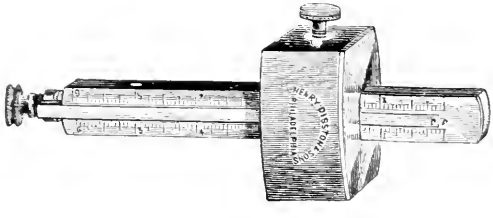
Iron handle, flush screw, parallel edges, steel blade, hardened and tempered.

No. 5½ TRY SQUARE



Iron handle, steel blade, hardened and tempered, graduated. Square inside and out.

No. 93 GAUGE



USEFUL INFORMATION.

To find circumference of a circle multiply diameter by 3.1416.

To find diameter of a circle multiply circumference by .31831.

To find area of a circle multiply square of diameter by .7854.

To find surface of a ball multiply square of diameter by 3.1416.

To find side of an equal square multiply diameter by .8862.

To find cubic inches in a ball multiply cube of diameter by .5236.

To ascertain heating surface in tubular boilers multiply ⅔ the circumference of boiler by length of boiler in inches and add to it the area of all the tubes.

One-sixth of tensile strength of plate multiplied by thickness of plate and divided by one-half the diameter of boiler gives safe working pressure for tubular boilers. For marine boilers add 20 per cent. for drilled holes.

Steam rising from water at its boiling point (212 degrees) has a pressure equal to the atmosphere (14.7 lbs. to the square inch).

To find the horse-power of Engines, multiply the area of piston by the average steam pressure. Multiply this product by the travel of piston in feet per minute, divide this product by 33,000 and the quotient will be the horse-power.

NOTE. As there is always a very appreciable difference between the pressure of steam in boiler and on piston we advocate figuring the steam pressure at just one-half the average amount carried on boilers. The result will then be nearer the actual power.

HYDRAULICS.

A cubic foot of water contains 7½ gallons, or 1,728 cubic inches, and weighs 62½ pounds.

A gallon of water contains 231 cubic inches, and weighs 8½ pounds (U. S. standard).

The friction of water in pipes is as the square of the velocity.

The capacity of pipes is as the square of their diameters; thus doubling the diameter of a pipe increases the capacity four times.

The height of a column of fresh water, equal to a pressure of one pound per square inch, is 2.31 feet. (In usual computations, this is taken as two feet, thus allowing for ordinary friction).

To find the area of a piston, square the diameter and multiply by .7854,

Each nominal horse-power of boilers requires 7½ gallons or one cubic foot of water per hour.

To compute the horse-power necessary to elevate water to a given height, multiply the total weight of column of water in pounds by the velocity per minute in feet, and divide the product by 33,000. (An allowance of 25 per cent. should be added for friction, etc.).

To compute the capacity of pumping engines, multiply the area of the water piston, in inches, by the distance it travels, in inches, in a given time. The product divided by 231 gives number of gallons in time named.

To find the capacity of a cylinder in gallons, multiply the area, in inches, by the length of stroke, in inches, which will give the total number of cubic inches; divide this product by 231 (which is the cubical contents of a gallon in inches), and quotient is capacity in gallons.

CARE OF BOILERS.

The following rules are compiled from those issued by various Boiler Insurance Companies in this country and Europe, supplemented by our own experience. They are applicable to all boilers, except as otherwise noted.

ATTENTION NECESSARY TO SECURE SAFETY.

1. Safety Valves.—Great care should be exercised to see that these valves are ample in size and in working order. Overloading or neglect frequently lead to the most disastrous results. Safety valves should be tried at least once every day to see that they will act freely.

2. Pressure Gauge.—The steam gauge should stand at zero when the pressure is off, and it should show same pressure as the safety valve when that is blowing off. If not, then one is wrong, and the gauge should be tested by one known to be correct.

3. Water Level.—The first duty of an engineer before starting, or at the beginning of his watch, is to see that the water is at the proper height. Do not rely on glass gauges, floats or water alarms, but try the gauge cocks. If they do not agree with water gauge, learn the cause and correct it.

4. Gauge Cocks and Water Gauges must be kept clean. Water gauge should be blown out frequently, and the glasses and pass-

ages to gauges kept clean. The Manchester, Eng., Boiler Association attributes more accidents to inattention to water gauges, than to all other causes put together.

5. Feed Pump or Injector.—These should be kept in perfect order, and be of ample size. No make of pump can be expected to be continuously reliable without regular and careful attention. It is always safe to have two means of feeding a boiler. Check valves and self-acting feed valves should be frequently examined and cleaned. Satisfy yourself frequently that the valve is acting when the feed pump is at work.

6. Low Water.—In case of low water, immediately cover the fire with ashes, (wet if possible) or any earth that may be at hand. If nothing else is handy use fresh coal or saw dust. Draw fire as soon as it can be done without increasing the heat. Neither turn on the feed, start or stop engine, or lift safety valve until fires are out, and the boiler cooled down.

7. Blisters and Cracks.—These are liable to occur in the best plate iron. When the first indication appears there must be no delay in having it carefully examined and properly cared for.

Fusible Plugs, when used must be examined when the boiler is cleaned, and carefully scraped on both the water and firesides, or they are liable not to act.

ATTENTION NECESSARY TO SECURE ECONOMY.

8. Cleaning.—All heating surfaces must be kept clean, outside and in, or there will be a serious waste of fuel. The frequency of cleaning will depend on the nature of fuel and water. As a rule, never allow over $\frac{1}{16}$ inch scale or soot to collect on surfaces between cleanings. Hand-holes should be frequently removed and surfaces examined, particularly in case of new boiler, until proper intervals have been established by experience.

9. Hot Feed Water.—Cold water should never be fed into any boiler when it can be avoided, but when necessary it should be caused to mix with the heated water before coming in contact with any portion of the boiler.

10. Foaming.—When foaming occurs in a boiler, checking the outflow of steam will usually stop it. If caused by dirty waters, blowing down and pumping up will generally cure it. In case of violent foaming, check the draft and fires.

11. Air Leaks.—Be sure that all openings for admission of air to boiler or flues except through the fire are carefully stopped. This is frequently an unsuspected cause of serious waste.

12. Blowing Off.—If the feed-water is muddy or salt, blow off a portion frequently, according to condition of water. Empty the boiler every week or two, and fill up afresh. When surface blow-cocks are used, they should be often opened for a few minutes at a time. Make sure no water is escaping from the blow-off cock when it is supposed to be closed. Blow-off cocks and check-valves should be examined every time the boiler is cleaned.

ATTENTION NECESSARY TO SECURE DURABILITY.

13. Leaks.—When leaks are discovered, they should be repaired as soon as possible.

14. Blowing Off.—Never empty the boiler while brick-work is hot.

15. Filling Up.—Never pump cold water into a hot boiler. Many times leaks, and in shell boilers, serious weakness, and sometimes explosions are the result of such an action.

16. Dampness.—Take care that no water comes in contact with the exterior of the boiler from any cause, as it tends to corrode and weaken the boiler. Beware of all dampness in seating or coverings.

17. Galvanic Action.—Examine frequently parts in contact with copper or brass where water is present, for signs of corrosion. If water is salt or acid, some metallic zinc placed in the boiler will usually prevent corrosion, but it will need attention and renewal from time to time.

18. Rapid Firing.—In boilers with thick plates or seams exposed to the fire, steam should be raised slowly, and rapid or intense firing avoided. With thin water tubes, however, and adequate water circulation, no damage can come from this cause.

19. Standing Unused.—If a boiler is not required for some time, empty and dry it thoroughly. If this is impracticable, fill it quite full of water and put in a quantity of common washing soda. External parts exposed to dampness should receive a coating of linseed oil.

20. General Cleanliness.—All things about the boiler room should be kept clean and in good order. Negligence tends to waste and decay.

WEIGHT OF METALS AND WOOD.

Substance.	Cubic Inch.
Aluminum	.0926 lbs.
Brass	.3194 "
Bronze	.3147 "
Copper	.3194 "
Gold, pure	.6965 "
" hammered	.7003 "
Iron, cast	.2607 "
" wrought	.2817 "
Lead, cast	.4106 "
" rolled	.4119 "
Mercury 40°	.5661 "
Nickel	.3133 "
Platinum	.7356 "
Silver, cast	.3788 "
Steel, plates	.2823 "
Zinc	.2482 "

DRY WOODS.	Cubic Foot.
Alder	50 lbs.
Apple	49 "
Ash	43 "
Beech	53 "
Butternut	23 "
Cedar	35 "
Cherry	44 "
Chestnut	38 "
Cypress	40 "
Ebony	83 "
Elm	38 "

Substance.	Cubic Foot.
Gum	62 lbs.
Hemlock	23 "
Hickory	49 "
Holly	47 "
Lance Wood	45 "
Larch	34 "
Lignum Vitæ	83 "
Linden	37 "
Locust	45 "
Logwood	57 "
Mahogany, Honduras	35 "
" Spanish	53 "
Maple	46 "
" Birds eye	36 "
Oak, white	53 "
" Live (green)	78 "
" African	51 "
Orange	44 "
Persimmon	44 "
Pine, pitch	41 "
" white	28 "
" yellow	34 "
Poplar	23 "
" white	33 "
Spruce	31 "
Sycamore	39 "
Teak	43 "
Walnut	42 "
" black	31 "
Willow	30 "

STRENGTH OF ICE.

Ice 2 inches thick will bear men on foot.

Ice 4 inches thick will bear men on horseback.

Ice 6 inches thick will bear logging teams with light loads.

Ice 8 inches thick will bear logging teams with heavy loads.

Ice 10 inches thick will bear 1,000 lbs. to the square foot.

This table is for pure sound ice.

To ascertain the number of feet (board measure) in a log of a given size, deduct four inches from its diameter at small end, square the remainder, multiply the product by the length of log and divide by 16, the result will be the board measure contents of log.

BELTING.

The average thickness of single belts is $\frac{3}{16}$ of an inch and a safe working load is assumed to be 45 lbs. per inch in width, which, at a velocity of 60 square feet per minute is equal to one horse power.

Belt motion should not exceed 3,000 per minute where narrow belts are run over small pulleys a distance of 15 feet between shafts, and which gives a sag of $1\frac{1}{2}$ to 2 inches in the belt is good practice. For main belts working on large pulleys a greater distance and sag is desirable.

The strongest side of the belt is the flesh side one-third the way through, therefore run the grain (hair) side on the pulley.

A common rule for determining the width of a single belt $\frac{1}{4}$ of an inch thick to transmit any number of horse power, is to multiply the actual horse power by 1,000 and divide by the velocity of belt in feet per minute, which gives the width in inches.

A belt 1 inch wide, 800 feet per minute—one horse power.

To find the length of a belt, add the diameter of the two pulleys together, divide the result by 2 and multiply quotient by $3\frac{1}{4}$, then add the product of twice the distance between centre of shafts and you have the length required.

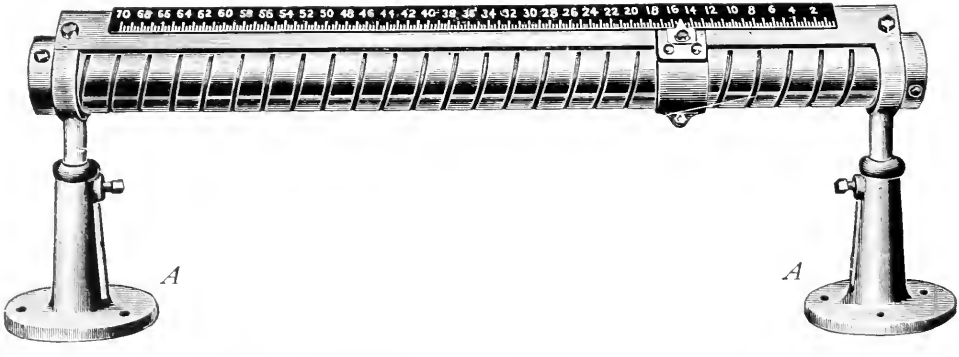
The resistance of belts to slipping is independent of their breadth. There is no advantage derived in increasing the width beyond that necessary to resist the strain to which it is subjected.

Long belts are more effective than short ones.

The strain of 350 lbs. per square inch of section is a safe working load. The pulley should be a little wider than belt.

PERFECT INDICATOR.

For adjustment of log to cut.



This indicator is in the shape of a cylinder to fit over the connecting shaft of Head Blocks on Saw Mill Carriage. The Stands marked "A" are made to screw on the carriage platform. The figures arranged on both sides of the brass plates, one for each, the Sawyer and Setter, being entirely out of the way of the setting lever and in full view of the operator, making the most simple, complete and least expensive Indicator now in use.

A FEW VIEWS

Showing Sections of

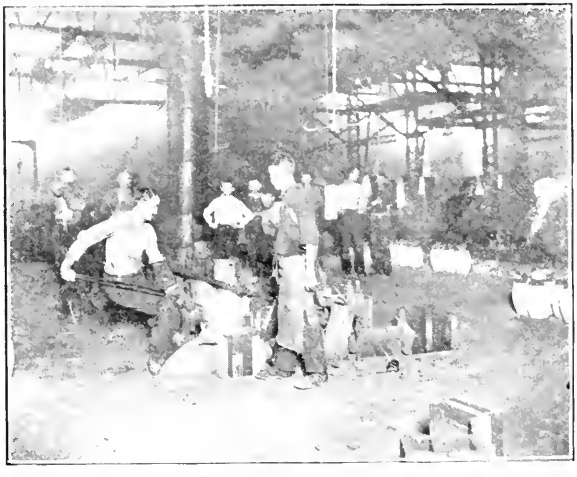
HENRY DISSTON & SONS, Inc.

KEYSTONE

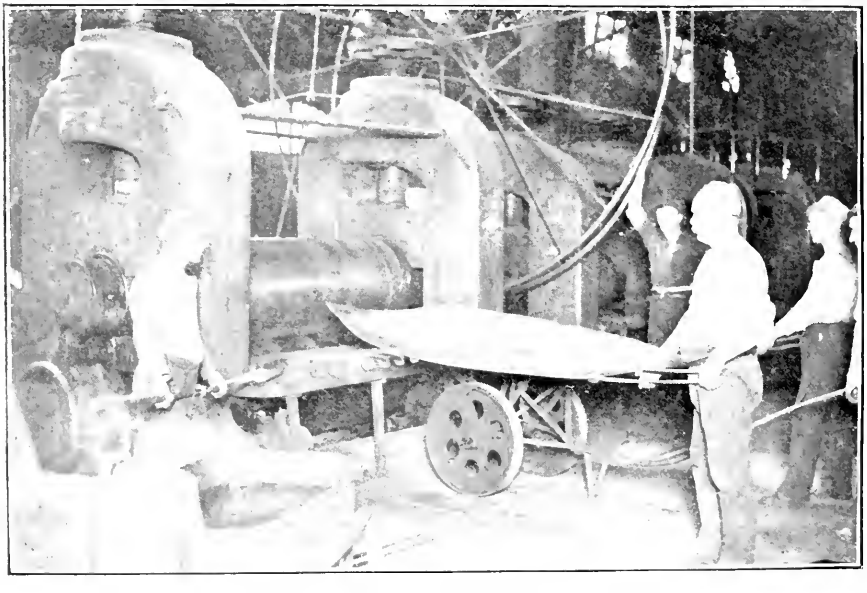
SAW, TOOL, STEEL and FILE WORKS

Philadelphia, Penna.

Views of Sections of Henry Disston & Sons' Saw Manufactory

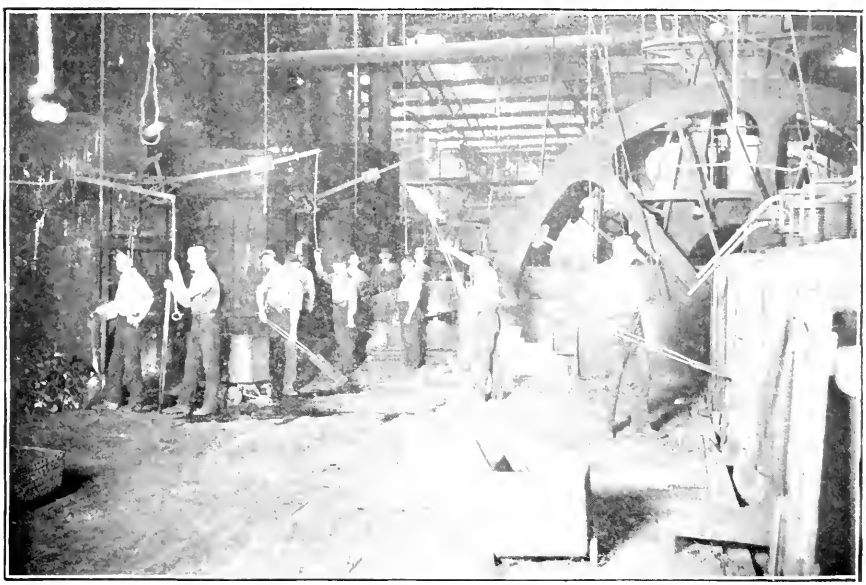


MAKING CRUCIBLE INGOTS FOR SAW STEEL

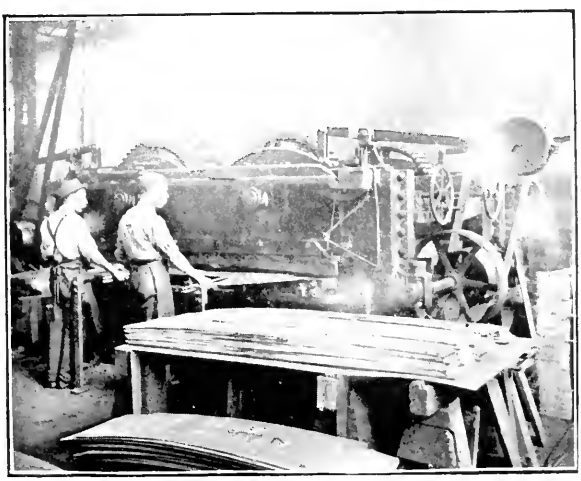


ROLLING CIRCULAR SAW PLATES

Views of Sections of Henry Disston & Sons' Saw Manufactory

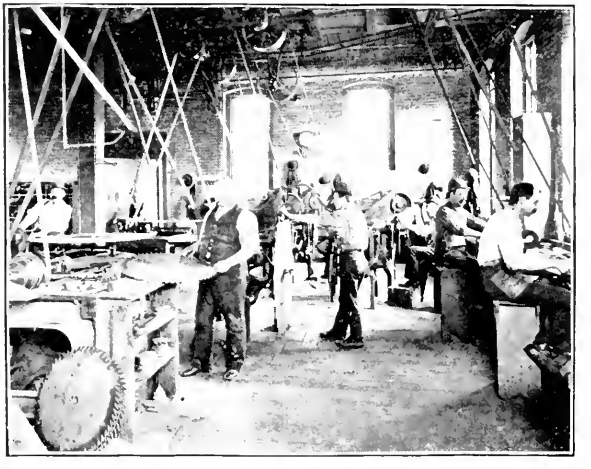


ROLLING HAND SAW STEEL

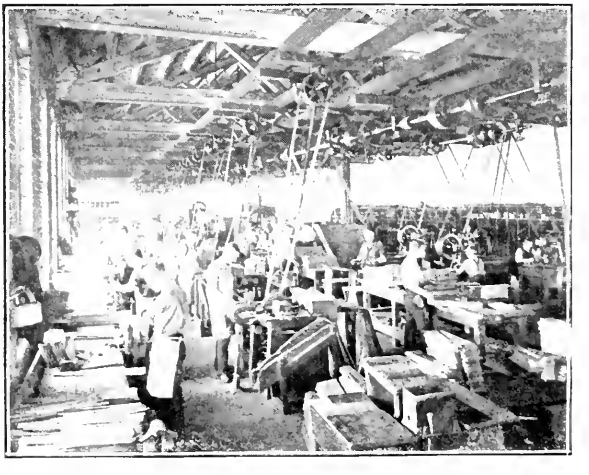


CUTTING OUT CROSS-CUT SAW PLATES

Views of Sections of Henry Disston & Sons' Saw Manufactory

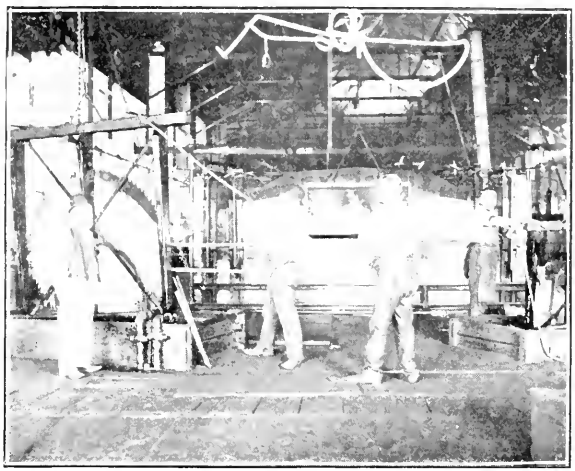


"GETTING-OUT" CIRCULAR SAWS

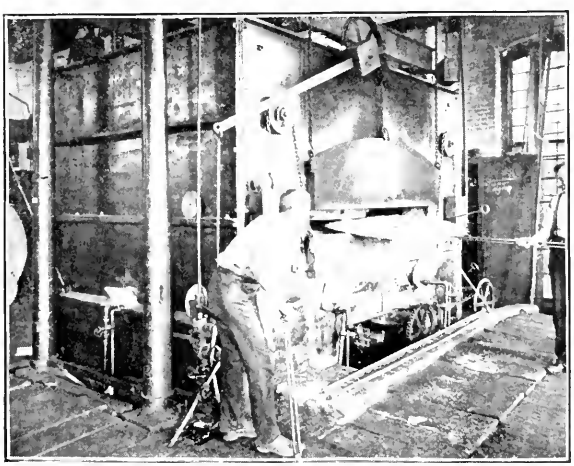


"GETTING-OUT" HAND SAW BLADES

Views of Sections of Henry Disston & Sons' Saw Manufactory

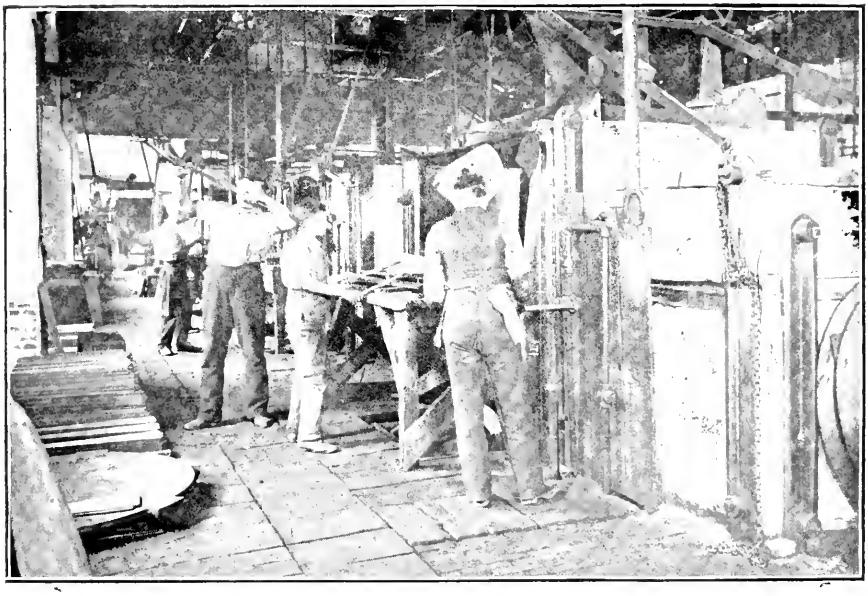


HARDENING CIRCULAR SAWS

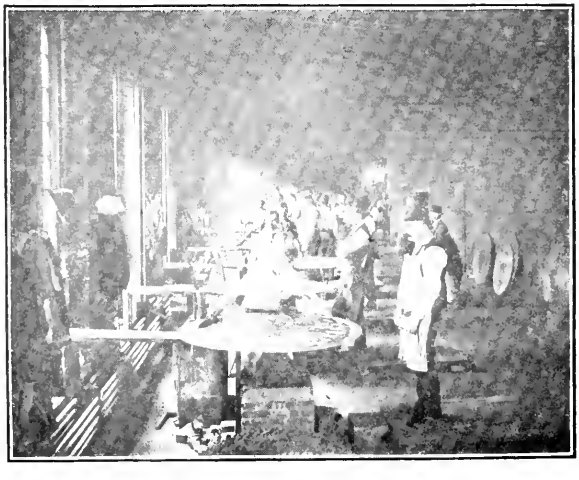


TEMPERING CIRCULAR SAWS

Views of Sections of Henry Disston & Sons' Saw Manufactory

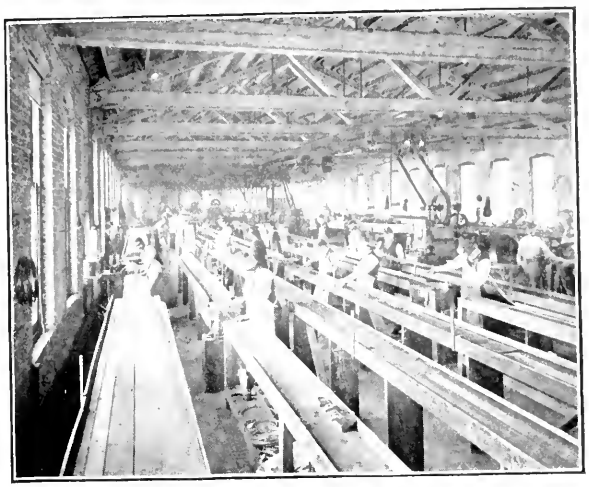


HARDENING AND TEMPERING HAND SAW BLADES

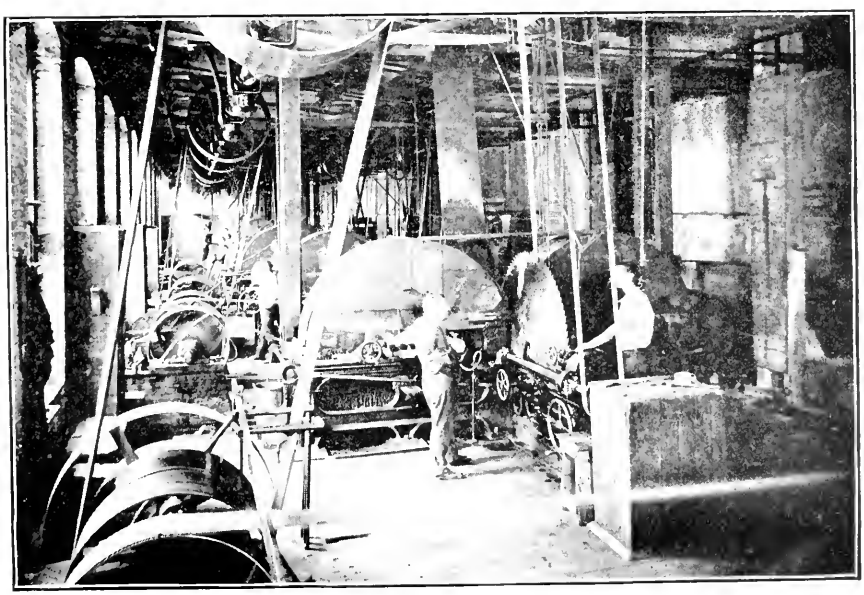


SMITHING, HAMMERING AND BLOCKING CIRCULAR SAWS

Views of Sections of Henry Disston & Sons' Saw Manufactory

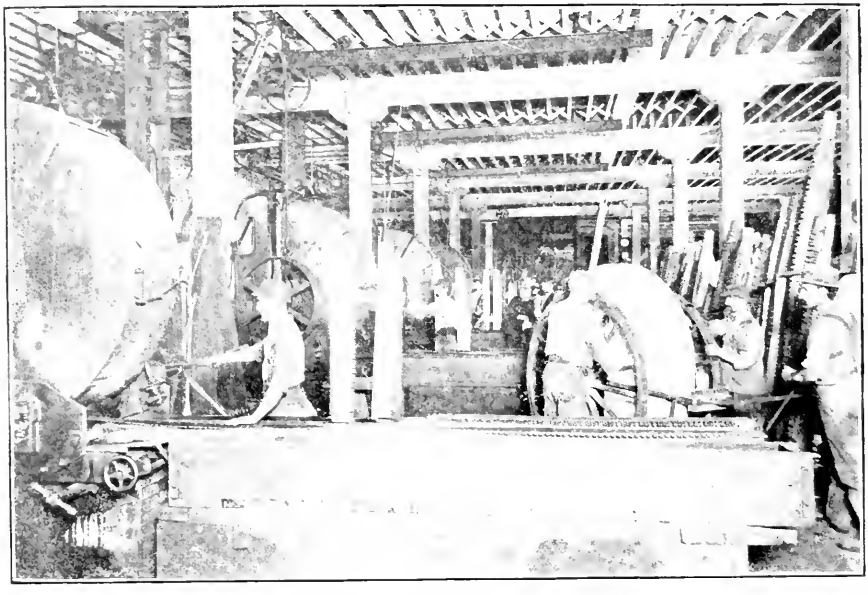


BLOCKING WIDE BAND SAWS

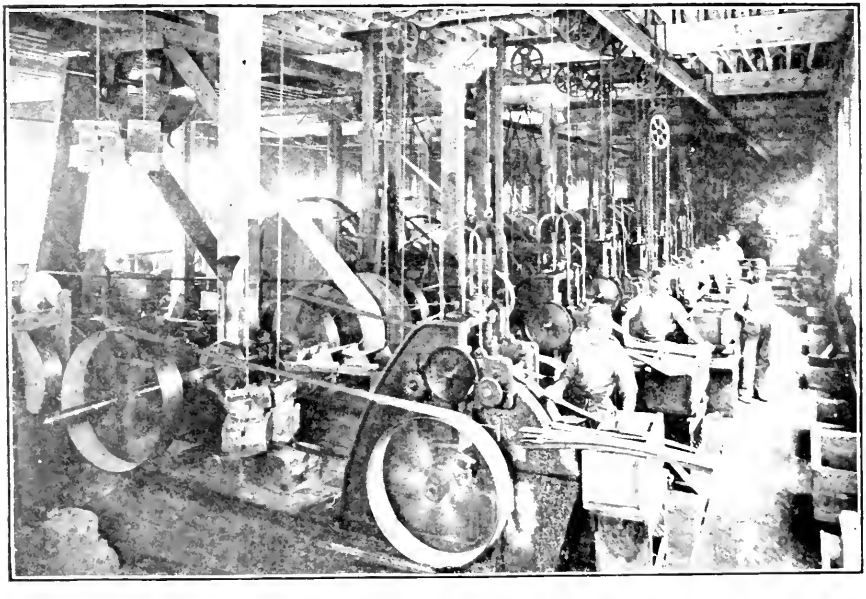


GRINDING CIRCULAR SAWS

Views of Sections of Henry Disston & Sons' Saw Manufactory

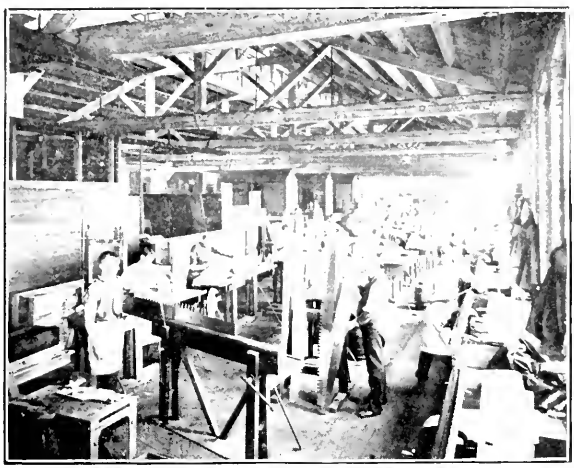


GRINDING CROSS-CUT SAWS

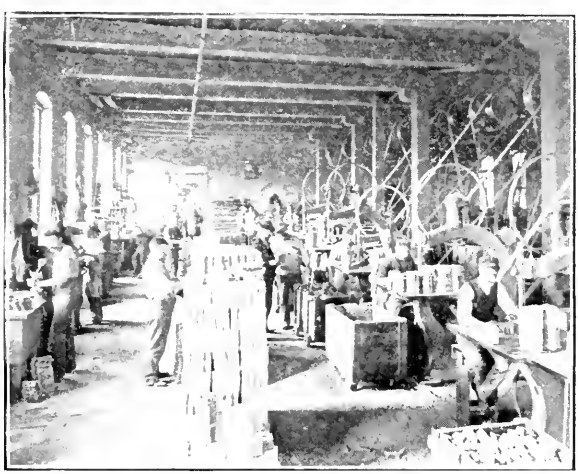


GRINDING HAND SAW BLADES

Views of Sections of Henry Disston & Sons' Saw Manufactory

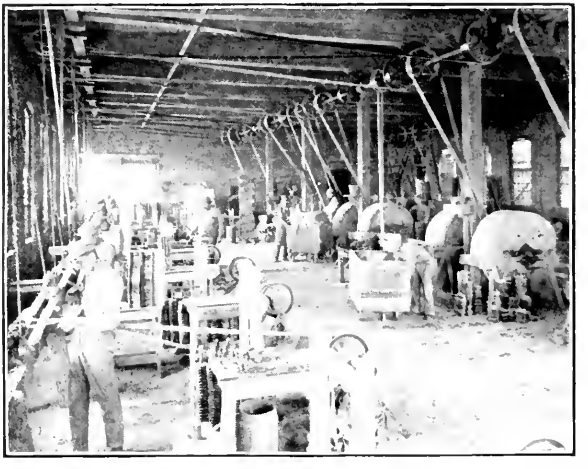


FILING LONG SAWS

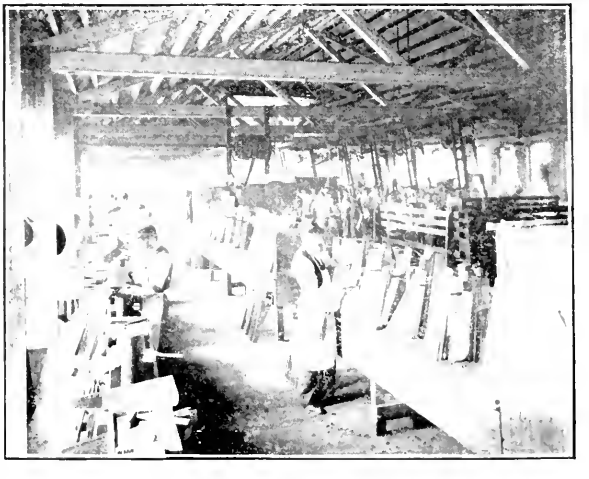


MAKING HAND SAW HANDLES

Views of Sections of Henry Disston & Sons' Saw Manufactory

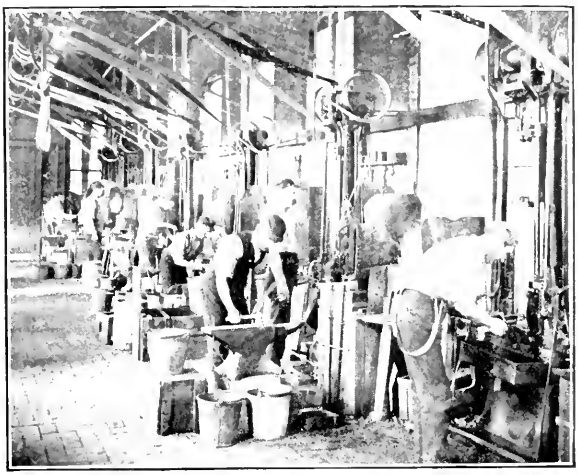


"BELTING" HAND SAW HANDLES

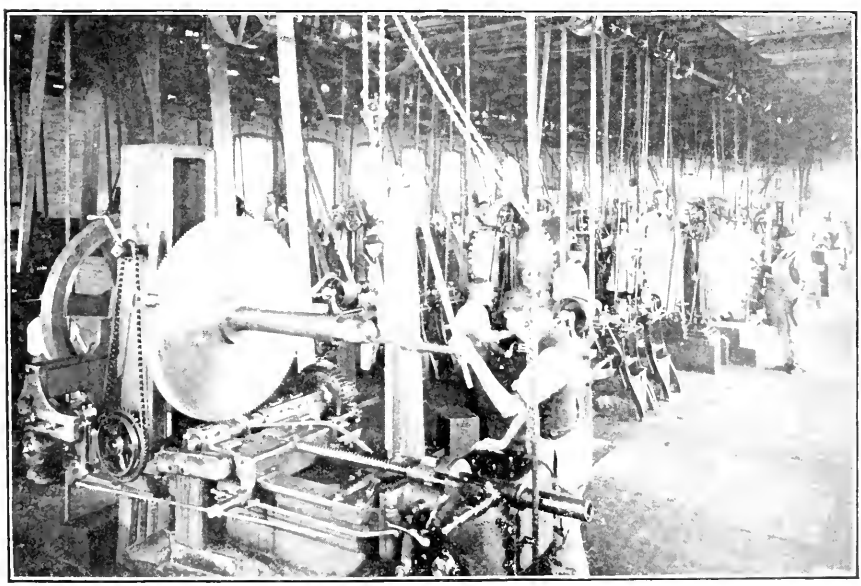


BLOCKING HAND SAWS

Views of Sections of Henry Disston & Sons' Saw Manufactory

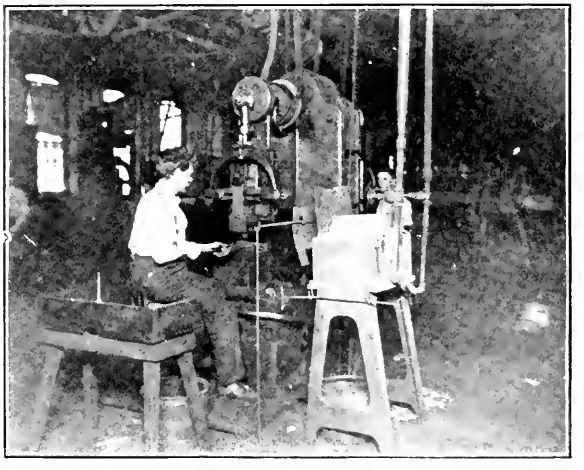


FORGING TEETH FOR CHISEL POINT CIRCULAR SAWS

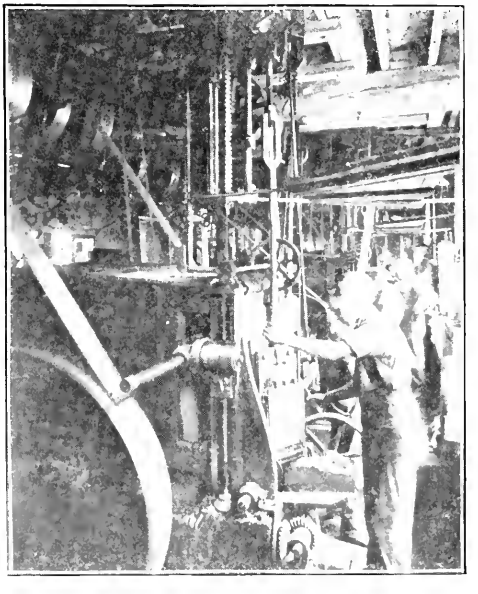


MILLING AND CHISEL POINT TOOTHING DEPARTMENT

Views of Sections of Henry Disston & Sons' Saw Manufactory

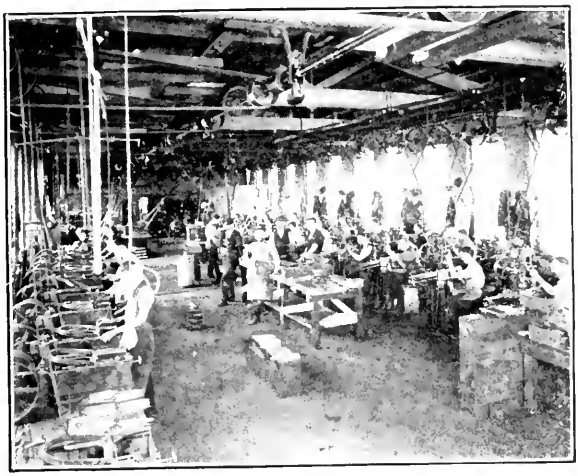


FORGING FILE BLANKS

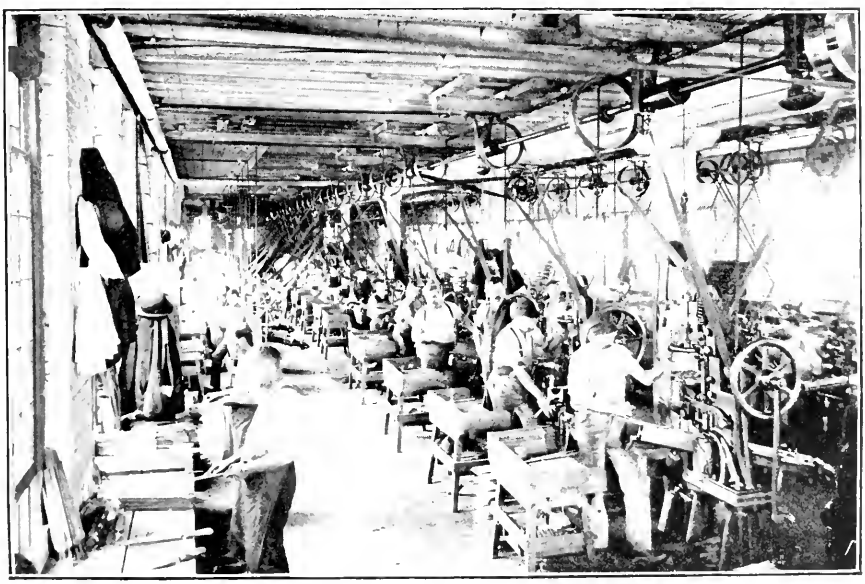


GRINDING FILE BLANKS

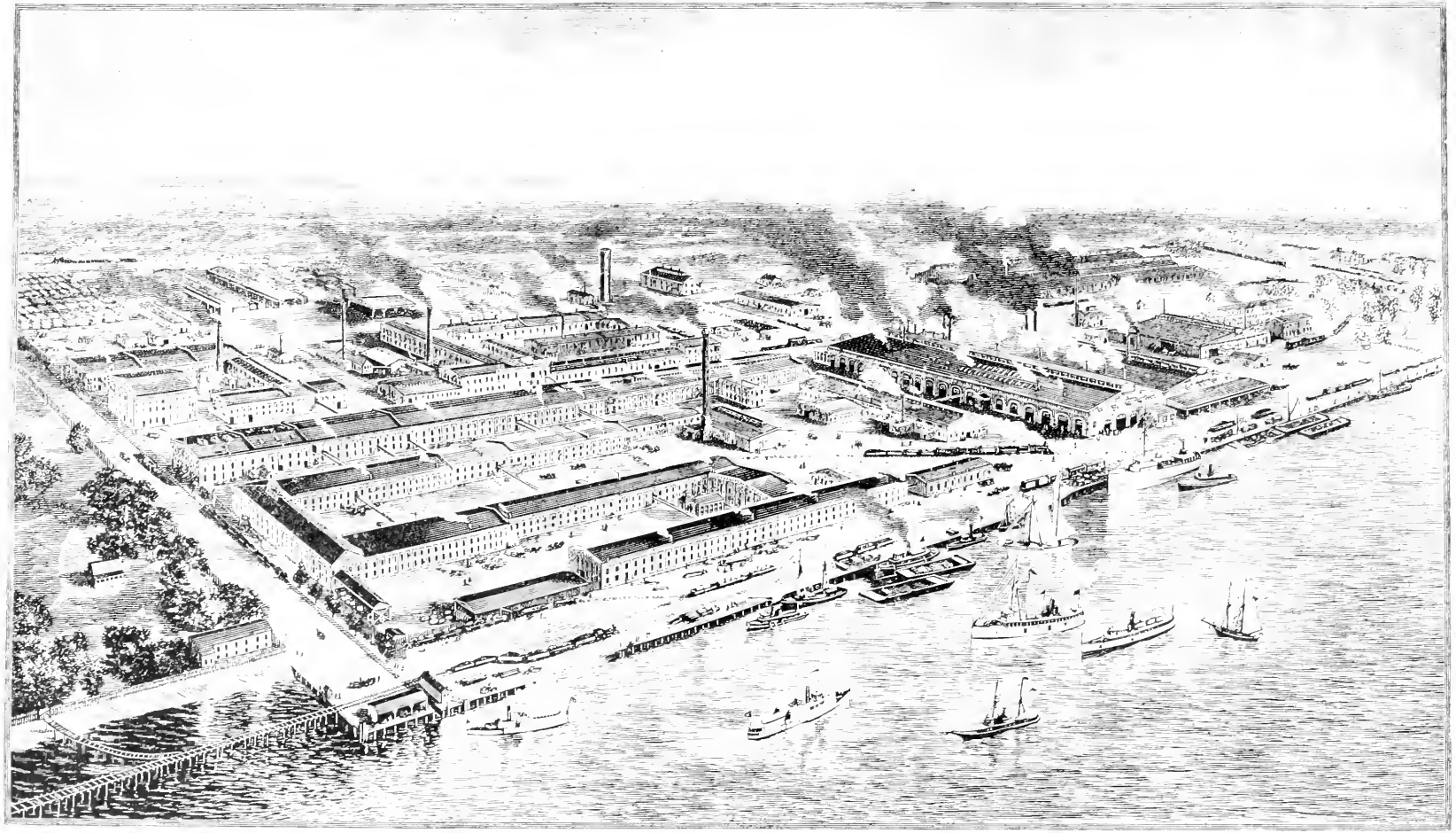
Views of Sections of Henry Disston & Sons' Saw Manufactory



"CUTTING" SMALL FILES



"CUTTING" LARGE FILES



PHOTOGRAPHIC REPRODUCTION OF PLANT OF HENRY DISSTON & SONS, Inc., THE LARGEST SAW MANUFACTURING HOUSE IN THE WORLD

First Prize—In Competition with

1874—Franklin Institute.
1876—Centennial Exhibition.
1877- Sydney Exhibition.
1878—Paris Exhibition.
1880—Sydney Exhibition.
1885—Victoria Jubilee.

Display of unsurpassed excellence of Material, Style and Finish, every article worthy of the highest commendation.